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FIELD SAMPLING
AND ANALYSIS PLAN

PHASE III REMEDIAL INVESTIGATION/
FEASIBILITY STUDY

BALLY ENGINEERED STRUCTURES SITE
BALLY, PENNSYLVANIA

TABLE OF CONTENTS

	<u>PAGE</u>
LIST OF TABLES/LIST OF FIGURES	v
1.0 INTRODUCTION	1-1
2.0 SUMMARY OF SITE INVESTIGATION ACTIVITIES	2-1
3.0 GENERAL ACTIVITIES	3-1
3.1 PROJECT MOBILIZATION	3-1
3.2 FIELD SAMPLING AND ANALYSIS PLAN	3-1
3.3 DESCRIPTION OF ANALYTICAL PROTOCOLS	3-2
3.3.1 Screening Analyses (DQO Level I) and Field Measurements	3-2
3.3.2 Laboratory Analyses (DQO Level IV)	3-3
3.4 NONEXPENDABLE EQUIPMENT DECONTAMINATION PROCEDURES	3-3
3.4.1 Sampling Equipment	3-3
3.4.1.1 Laboratory (Office) Pre-Investigation Decontamination	3-3
3.4.1.2 Field Decontamination	3-4
3.4.2 Drilling Equipment Decontamination Procedures	3-5
3.5 SAMPLE CONTAINER REQUIREMENTS AND HOLDING TIMES	3-5
3.6 SAMPLE PACKAGING AND SHIPPING	3-5
3.7 COORDINATION WITH THE LABORATORY	3-6
3.8 SAMPLE DOCUMENTATION CHAIN-OF-CUSTODY AND FIELD RECORD-KEEPING	3-7
3.8.1 Sample Documentation	3-7
3.8.2 Sample Custody	3-7
3.8.2.1 Field Custody Procedures	3-8
3.8.2.2 Transfer of Custody and Shipment	3-8
3.8.2.3 Laboratory Custody Procedures	3-9
3.8.3 Field Recordkeeping	3-10
3.9 DATA QUALITY OBJECTIVES (DQOs)	3-10
3.10 BASE MAPPING AND FIELD SURVEY REQUIREMENTS	3-11
4.0 INITIAL FIELD ACTIVITIES	4-1
4.1 BACKGROUND LITERATURE REVIEW	4-1
4.2 EVALUATION OF GROUND WATER USERS	4-1

830409

AR300409

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



TABLE OF CONTENTS
(Continued)

	<u>PAGE</u>
4.3 BASELINE GROUND WATER SURVEY	4-1
5.0 SAMPLING ACTIVITIES - SOURCE DELINEATION AND CHARACTERIZATION	5-1
5.1 WASTE LAGOON CHARACTERIZATION	5-1
5.1.1 Sampling Stations	5-1
5.1.2 Analytical Parameters	5-2
5.1.3 Sampling Methods	5-2
5.1.4 Sample Preservation and Handling	5-3
5.1.5 Replicate Samples	5-3
5.2 DEGREASING AREA INVESTIGATION	5-3
5.2.1 Sampling Stations	5-3
5.2.2 Analytical Parameters	5-4
5.2.3 Sampling Methods	5-4
5.2.4 Sample Preservation and Handling	5-4
5.2.5 Replicate Samples	5-4
5.3 SURVEYED LOCATION REQUIREMENT	5-5
6.0 EXPLORATORY DRILLING PROGRAM	6-1
6.1 BEDROCK COREHOLE LOCATIONS	6-1
6.2 CORING AND LOGGING METHODS	6-1
6.3 HANDLING OF DRILL CUTTINGS AND FLUIDS	6-2
6.4 SURVEYED LOCATION REQUIREMENT	6-2
7.0 MONITORING WELL INSTALLATION	7-1
7.1 WELL LOCATIONS	7-1
7.2 MONITORING WELL CONSTRUCTION PROCEDURES	7-1
7.2.1 Shallow Monitoring Wells	7-1
7.2.2 Intermediate Depth Monitoring Wells	7-3
7.2.3 Deep Monitoring Wells	7-3
7.3 WELL SECURITY	7-4
7.4 WELL DEVELOPMENT	7-4
7.5 HANDLING OF DRILL CUTTINGS AND FLUIDS	7-5
7.6 SURVEYED LOCATION REQUIREMENT	7-5

AR300410



TABLE OF CONTENTS
(Continued)

	<u>PAGE</u>
8.0 AQUIFER PERFORMANCE TESTING	8-1
8.1 TEST METHODOLOGY	8-1
8.2 HANDLING OF DISCHARGE WATER	8-2
9.0 SURFACE AND GROUND WATER SAMPLES	9-1
9.1 SAMPLING STATIONS	9-1
9.2 PARAMETERS	9-1
9.3 GROUND WATER SAMPLING METHODS	9-1
9.4 SURFACE WATER SAMPLING METHODS	9-2
9.5 SAMPLE PRESERVATION AND HANDLING	9-3
9.6 REPLICATE SAMPLES	9-3
10.0 QUALITY ASSURANCE/QUALITY CONTROL	10-1
10.1 FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE	10-1
10.1.1 Field Calibration	10-1
10.1.2 Preventive Maintenance	10-2
10.2 QUALITY CONTROL FOR ANALYTICAL DATA	10-3
10.2.1 Quality Control Samples	10-3
10.2.1.1 Field	10-3
10.2.1.2 Laboratory	10-5
10.2.2 Performance and System Audits	10-5
10.2.2.1 Performance Audits	10-5
10.2.2.2 System Audits	10-5
10.2.3 Data Reduction, Validation and Reporting	10-6
10.2.4 Data Quality Criteria (Precision, Accuracy, and Completeness)	10-7
10.2.4.1 Field Measurements	10-7
10.2.4.2 Laboratory	10-9
10.3 DOCUMENTATION	10-9
10.4 CORRECTIVE ACTION	10-9
10.4.1 Corrective Action - Remcor	10-9
10.4.2 Corrective Action - Laboratory	10-10

AR300411

800000

TABLE OF CONTENTS
(Continued)

	<u>Page</u>
10.4.3 Contingency Plan	10-10
10.5 QUALITY ASSURANCE REPORTS TO MANAGEMENT	10-10
REFERENCES	
TABLES	
FIGURES	
APPENDIX A - FIELD INSTRUMENT OPERATION/CALIBRATION	
APPENDIX B - DOCUMENTATION FORMS	

800013

LIST OF TABLES

<u>TABLE NO.</u>	<u>TITLE</u>
3-1	Analytical Sample Summary
3-2	Summary of Analytical Methods and Protocol, Soil and Water Analysis
7-1	Proposed Monitoring Well Summary, Bally Engineered Structures Site RI/FS

LIST OF FIGURES

<u>FIGURE NO.</u>	<u>TITLE</u>
1-1	Site Location Map
5-1	Current Site Layout
5-2	Proposed Waste Characterization Sample Locations
6-1	Proposed Boring and Monitoring Well Locations
7-1	Well Construction Details
9-1	Proposed Ground Water Sampling Locations

200113

AR300413

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



1.0 INTRODUCTION

The Field Sampling and Analysis Plan (FSAP) for the Bally Engineered Structures (BES) site describes quality assurance/quality control (QA/QC) procedures applicable to environmental measurements to be undertaken during the Phase III Remedial Investigation (RI). The FSAP discusses the location, rationale, protocol, and methodology for sample collection, processing, shipping, and/or analyses. The plan ensures that sampling activities will be limited to those that are necessary and sufficient. The plan also discusses operating procedures and logging techniques to be used during monitoring well drilling, installation, and development and standard procedures to be used in aquifer testing, including a baseline ground water survey and a large-scale (48 to 72 hours) continuous pumping test.

This FSAP was prepared by Remcor, Inc. (Remcor) of Pittsburgh, Pennsylvania on behalf of BES. This document and the site-specific Health and Safety Plan (HASP) (Remcor, September 1987a) constitute the Remedial Investigation Site Operations Plan (RISOP) as required by Section VIII (Work to be Performed) of the Administrative Order by Consent (ACO), January 28, 1987 between BES and the U.S. Environmental Protection Agency (EPA) Region III (EPA, January 28, 1987). The RISOP supplements the Work Plan for the Remedial Investigation and Feasibility Study (RI/FS) (Remcor, September 1987b) at the BES site. Figure 1-1 provides a site location map for reference; additional site background data may be found in the RI/FS Work Plan. Section X (Quality Assurance) of the ACO requires preparation of a Quality Assurance Project Management Plan (QAPMP). In accordance with options provided by "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," (EPA, December 29, 1980), the 16 required QAPMP elements have been incorporated into various portions of the Work Plan and FSAP. A separate document entitled "Quality Assurance Project Management Plan - Index" has been prepared to identify the various required components. Sample handling, processing, and documentation will conform to the "EPA NEIC Policies and Procedures Manual" (EPA, May 1978; Revised November 1984).

206151

Laboratory analyses will conform to the most current EPA Contract Laboratory Program (CLP) "Statement of Work for Organics Analysis" (CLP, July 1987). Validation of laboratory analytical results will be in accordance with "Functional Guidelines for Evaluating Organics Analysis" (EPA, April 1985).

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2.0 SUMMARY OF SITE INVESTIGATION ACTIVITIES

Site background information is discussed in detail in Chapter 2.0 of the RI/FS Work Plan (Remcor, September 1987b) and the Statement of Work is provided in Section 4.2 of that document. The RI field investigation activities planned for the BES site include conducting three distinct tasks to further define the extent of the problem and to aid in the design of ground water cleanup alternatives. These tasks are as follows; task nomenclature follows that established in the RI/FS Work Plan:

- Task 3 - Baseline Ground Water Study

A baseline aquifer study to define the effects of current municipal, industrial, and domestic ground water removal on the water table in the Borough of Bally in advance of and following resumption of pumping at Bally Well No. 3 as a public water supply

- Task 4 - Source Characterization

Shallow soil sampling to characterize the potential waste source areas

- Task 5 - Hydrogeologic Investigation

Exploratory core drilling and geophysical logging to define subsurface lithologies and stratigraphy

Monitoring well drilling and installation and subsequent sampling of monitoring wells, and residential/municipal/industrial wells to further define plume extent

Aquifer performance testing to define hydrogeologic parameters and to aid in development of aquifer remediation alternatives

Surface water (wetland) sampling.

These RI activities, in conjunction with those previously undertaken by Environmental Resources Management, Inc. (ERM) in the Phase II RI, are designed to provide data sufficient to determine source areas, contaminant distribution, contaminant transport, and actual or potential receptors, as well as to support evaluation and design of remedial alternatives. These tasks are discussed in detail in Chapters 5.0 through 9.0 of the FSAP.

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AR300416

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



3.0 GENERAL ACTIVITIES

3.1 PROJECT MOBILIZATION

Following approval of the draft Work Plan, the FSAP, and the QAPMP a site command post will be established. The command post can either be available office space at the BES plant or a mobile office trailer. In either case, electricity and telephone lines will be supplied to the command post so that necessary field activities can be performed. The office will also include a wash-up area and sanitary facilities nearby for site workers.

The office will also serve as a storage area for equipment to be used for field sampling and surveying activities. In connection with the mobilization effort, all required field sampling and analytical equipment will be obtained, tested, and calibrated to ensure that the equipment is in sound working order to initiate the RI study. This equipment will be deployed to the site on an as-needed basis.

3.2 FIELD SAMPLING AND ANALYSIS PLAN

The FSAP has been prepared to define the applicable techniques and protocols necessary to conduct the RI at the BES site. The plan discusses data quality objectives (DQOs), laboratory methods, sampling procedures, recordkeeping, equipment decontamination, and QA/QC procedures. Sampling activities will be limited to those necessary to complete the scope of work.

All environmental samples will be taken according to the location and method stated in Chapters 5.0 and 9.0. However, ambient atmospheric conditions, physical condition of wells, or other obstacles may require deviation from the original sampling points on an isolated basis. Any method or location modification, addition, or deletion will be clearly documented in the field log book and recorded on the site map. Modifications which, in the judgement of the field team leader, remain responsive to the objectives of the sampling effort will not require

203027

authorization from the EPA prior to implementation. In the unlikely event that substantive field modifications are required, the EPA project officer will be notified immediately and approval will be sought before proceeding. Should circumstances prevent timely approval of the modification by the EPA, Remcor will exercise best professional judgement in proceeding. A permanent written summary of any changes in the proposed sampling activities and the cause for the modifications will be available in the field log book. A synopsis of substantive modifications will be presented in the final RI/FS report.

3.3 DESCRIPTION OF ANALYTICAL PROTOCOLS

3.3.1 Screening Analyses (DQO Level I) and Field Measurements

Soil samples from suspected source areas (i.e., lagoons, degreasing areas), as well as drill cuttings and ground water intercepted during monitoring well installation, will be scanned for evidence of volatile organic contamination (VOC). In general, all samples will be field screened upon collection.

Analysis will be by use of an organic vapor analyzer (OVA) (i.e., flame or photoionization detector capable of measuring VOC in environmental samples). The instrument probe may be passed in close proximity to the water or soil to obtain a first approximation of the VOC. Alternatively, samples will be placed in laboratory-certified clean volatile organics analyses (VOA) vials or soil jars, leaving about one-third of the vial's volume as headspace above the sample. The vials will be sealed and allowed to remain in this condition for about one hour to permit adequate time for the VOC in the medium to be analyzed to come into equilibrium with the headspace. The headspace gases will then be analyzed via the OVA to obtain a preliminary measure of the VOC.

Aqueous samples will be routinely analyzed upon collection for pH, conductivity, and temperature. Appendix A provides specific details for the operation of field screening instrumentation to be used in the RI.

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3.3.2 Laboratory Analyses (DQO Level IV)

In accordance with Section X (Quality Assurance) of the final Administrative Order by Consent (EPA January 28, 1987), all laboratory analyses and laboratory data reports will be performed in accordance with the most current "Statement of Work for Organics Analysis" (CLP, July 1986).

Table 3-1 provides a summary of the environmental samples and quality control samples by medium that are anticipated in the RI study.

3.4 NONEXPENDABLE EQUIPMENT DECONTAMINATION PROCEDURES

This section details decontamination sequences to be followed for reusable sampling and drilling equipment. All expendable equipment (e.g., bailer drop lines) will be dedicated to single samples and discarded after use.

3.4.1 Sampling Equipment

3.4.1.1 Laboratory (Office) Pre-Investigation Decontamination

All reusable sampling equipment will be considered contaminated before undergoing a documented decontamination procedure. Prior to use in the field, all sampling devices to be used in the investigation will be decontaminated according to the procedures listed below. Decontamination documentation will be kept in a master log as well as on a label affixed to each sampling device package. The following items are required for decontamination of sampling equipment associated with organics analysis:

- Steam cleaning machine (steam generator)
- Solvent rinse (Hexane)
- Rinsate container drums
- Water spraying device
- Brushes
- Enough plastic bags to double bag all disposable items
- Deionized water

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- Buckets
- Plastic basin (e.g., swimming pool)
- Plastic ground sheet
- Aluminum foil
- Package labels.

Sampling equipment will be decontaminated as follows over the plastic ground sheet:

- Place contaminated equipment in plastic pool. Use steam cleaner to strip visible dirt from equipment.
- Rinse with solvent.
- Rinse with deionized water.
- Air dry equipment and package in aluminum foil.
- label package with date of decontamination.
- Document procedure in the decontamination log.
- Containerize the rinsate and dispose of properly.

3.4.1.2 Field Decontamination

Dedicated sampling devices will be used where practical, obviating the need for field decontamination. When use of dedicated equipment is not feasible, field decontamination is required. Field decontamination should occur once per device per field investigation to minimize the risk of cross contamination. Each field decontamination process will be recorded in the field log book as it is performed. Field decontamination differs from that outlined in the laboratory (office) as follows:

- If a steam clean machine is not available, wash with tap water, rinse with deionized water, and proceed to Step 2 (solvent rinse).
- Field decontamination documentation will be kept in the field log.
- Packaging in aluminum foil is not necessary if the equipment is to be reused immediately.

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Rinsate from field decontamination procedures will be contained by a plastic pool (basin) which overlies a plastic ground sheet. Upon completion of the decontamination procedures, the rinsate will be containerized and transported to an existing temporary storage at the BES site to await off-site removal.

3.4.2 Drilling Equipment Decontamination Procedures

All drilling equipment will be decontaminated by high-pressure steam at a designated decontamination pad. The pad will be constructed of a three-sided, wooden plank frame, lined with a heavy plastic tarp. The pad will be designed to be portable so that it can be moved to various locations as the drilling progresses. The pad will be situated on a gentle slope and the rig will be driven to the pad. All water associated with the decontamination process will drain to the low end of the pad where it will be collected in 55-gallon Department of Transportation (DOT)-approved drums. The drums will be transported to an existing temporary storage area at the BES plant to await proper disposal in concert with BES customary waste disposal practices. No specific classification testing is anticipated at this time; handling and processing of the drums will be based on samples taken of the drum contents or nearby environmental media. Storage at the BES facility will be for less than 90 days.

3.5 SAMPLE CONTAINER REQUIREMENTS AND HOLDING TIMES

Sample container requirements and holding times are summarized in Table 3-2 for both solid and aqueous samples.

3.6 SAMPLE PACKAGING AND SHIPPING

All analytical samples collected will adhere to the following procedure:

- Label the sample by completing and affixing a sample tag or label
- Add preservatives, where required
- Tape the bottle closed with polyvinyl chloride (PVC) electrical tape

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- Mark the fill level on the bottle with indelible ink
- Fill out the required sample documentation as discussed in Section 3.8
- Seal the sample bottle inside a plastic bag
- Pack samples for shipping.

All samples will be stored in coolers immediately after collection and preparation. A typical sample tag, custody seal, and other sample documentation are contained in Appendix B.

Vermiculite (or approved equivalent) will be used as a packing material because it is light, absorbent, inert, and absorbs shock well. Sealed ice packs will be kept within the cooler to chill the environmental samples.

3.7 COORDINATION WITH THE LABORATORY

NUS Laboratories (NUS), Pittsburgh, Pennsylvania, will provide subcontract laboratory support to Remcor for the RI. Ms. Peg Marple of NUS will serve as the primary point of contact between the Remcor project manager and the laboratory.

The Remcor project manager will ensure that all sample collection is scheduled with NUS at least two weeks prior to anticipated submittal of samples. This will include obtaining all necessary sample containers, documentation, reagents, etc. At this time, a tentative schedule for submittal of samples will be developed. The laboratory will be notified by Remcor field personnel under the direction of the project manager no later than 24 hours prior to actual sample submittal and will be further notified upon sample shipment so that NUS can anticipate sample receipt. Most often, the samples will be shipped via express courier, with delivery to the laboratory within 24 hours of collection. The Remcor project manager will contact the laboratory to verify receipt. Ms. Marple will

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be responsible for sample custody while samples are at the laboratory, and will ensure that a sample custody log is maintained for each sample shipment in accordance with the requirements of the current CLP Statement of Work (CLP, July 1987).

3.8 SAMPLE DOCUMENTATION CHAIN-OF-CUSTODY AND FIELD RECORDKEEPING

3.8.1 Sample Documentation

In order to identify and track each sample through shipping and laboratory analysis, the following documents will be prepared:

- Sample labels (stating project number, name, type of sample, location, date, and time)
- Chain-of-custody forms
- Custody seals (as required for each container of samples shipped, to be affixed to the container in a way such that it cannot be opened without breaking the seal)
- Airbills (one for each sample shipment)
- Sample log sheet (one for each sample, stating sample type, number, collector(s), container, preservative, sample location, and analysis to be run, laboratory, date/time collected, and date/time shipped).

Examples of required documentation have been provided in Appendix B. Sample documentation and custody procedures will follow the "EPA NEIC Policies and Procedures Manual" (EPA, May 1978; revised November 1984).

3.8.2 Sample Custody

Possession of samples collected during field investigations must be traceable from the time the samples are collected until they or their derived data are used as evidentiary material in enforcement or other regulatory proceedings. Chain-of-custody procedures are followed to maintain sample possession. A sample is under custody if:

000133

- It is in possession of a member of the Remcor sampling team
- It is in plain view, after being in possession
- It was in possession and is locked up (secured)
- It is in a designated secure area.

3.8.2.1 Field Custody Procedures

The field crew will collect only the number of samples needed to represent the media being sampled. To the extent possible, the quantity and types of samples and sample locations will be determined prior to the actual field work. As few people as possible should handle samples. The field sampler is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched. Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions. The project manager will determine whether proper custody procedures were followed during the field work and will decide if additional samples are required.

3.8.2.2 Transfer of Custody and Shipment

Transfer of samples from the field is a very important step in the sampling activity. The following steps outline the procedures to be followed for transfer of custody:

- A chain-of-custody record (see Appendix B) is completed when transferring possession of samples. The relinquishing party (the sampler) and the receiving party (the courier or the laboratory representative) will sign, date, and note the time on the record. This form documents sample custody transfer for the samples through a courier to the sample custodian at NUS Laboratories.
- The samples will be packaged according to Section 3.6 and the sample container will be sealed with a chain-of-custody seal (Appendix B). Each package (i.e., cooler) will be shipped with a separate chain-of-custody form.

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- In accordance with NEIC guidelines, samples may be split with any governing regulatory authority. A transfer of samples form will be completed with both the sampler's and regulatory official's signature. In the event a signature is not possible, the split sample will be indicated in the signature space.
- The original chain-of-custody form will accompany the samples and the project manager will retain a file copy.
- Upon receipt of the samples, the authorized laboratory representative (sample custodian) will initial the sample numbers on the chain-of-custody forms and inform the project manager of any discrepancies.

3.8.2.3 Laboratory Custody Procedures

Laboratory custody procedures and an authorized sample custodian will be identified by the Remcor project manager prior to sampling activities.

Upon receipt of the samples, the laboratory will adhere to the following custody protocol:

- A designated sample custodian will accept custody of the shipped samples and verify that the information on the sample tags matches that on the chain-of-custody record. A check mark, initials, and date are placed in the sample label verification column on the chain-of-custody form. Pertinent information as to shipment, pickup, courier, etc. is entered in the "Remarks" section.
- The laboratory custodian will use the sample number to track each sample tag and will ensure that all samples are transferred to the proper analyst or stored in the appropriate secure area.
- Laboratory personnel will be responsible for the care and custody of samples from the time they are received until the sample is exhausted or returned to storage.

Samples received by the laboratory will be retained until after analyses and quality assurance checks are completed. Sample containers and

203025

remaining sample material will be disposed appropriately when all analyses and related quality assurance work are completed, but in no case will samples be disposed without confirmation from the Remcor project manager.

NUS Laboratories will maintain analytical data generated pursuant to the BES RI on magnetic tape (mass spectrometer [MS] data) and floppy disks (gas chromatography [GC] data) for a period of four years from the date of analysis. This data can be retrieved at any point for further review and preparation of hard copy.

3.8.3 Field Recordkeeping

The field team will maintain a bound, weatherproof notebook. This notebook for each sampling activity will be completed at each sampling station and will contain sample particulars, measurements, and observations. The field operations leader or his designee will record information in this notebook.

A site logbook will be maintained at the field office. This book will contain a summary of the day's activities, including a site visitors log and health and safety equipment use reports (see site-specific HASP), and will reference the sample team's notebooks. Individual field notebooks (e.g., geologists' notebooks) will also be referenced. A sample logbook will also be maintained in the field office. This book will be a compendium of the sample log sheets, discussed above.

3.9 DATA QUALITY OBJECTIVES (DQOs)

Data obtained from the Phase III RI study will either be used for definition of the presence or absence of VOC in environmental samples (i.e., water or soils), or will be used in the evaluation of public health and environmental concerns and in design of remedial action.

DQO Level I (Screening Quality) will be adequate to provide rapid turnaround data in the field to be used as a criterion in selecting soil

200426

samples to be forwarded for laboratory analyses. Screening of ground water will also be used to determine whether VOCs are vertically distributed within the aquifer, providing a criterion that will be used in establishing the elevation of the well screen or otherwise open section of the well.

The ACO, at Section X (Quality Assurance) requires that all laboratory analyses be performed in accordance with the most current "Statement of Work of the EPA Contract Laboratory Program" (CLP, July 1987). As such, the ACO requires DQO Level IV data for all laboratory analyses. DQO Level IV is consistent with the use of these data for evaluation of the extent of the VOC ground water contaminant plume, as well as use of the data in evaluating public health concerns and in design of the remedial action.

3.10 BASE MAPPING AND FIELD SURVEY REQUIREMENTS

The "Topographical Survey" map (Spotts, Stevens, and McCoy, Inc., July 1975) of the Borough of Bally will be used as a base map. This mapping was produced from a topographical survey adopted by the Borough on November 28, 1939, and will be adequate to show the planimetric relationships between surface features, predominantly streets and utilities, and the various residential, municipal, industrial, and monitoring wells within the Borough. Surveyed plant layout drawings will be used as base maps to accurately locate sampling points, wells, and other points of interest on the BES property.

All elevations will be to the nearest 0.01 foot and will be referenced to the U.S. Geological Survey Vertical Datum. Horizontal accuracy will be to the nearest 0.1 foot.

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AR300427

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



4.0 INITIAL FIELD ACTIVITIES

4.1 BACKGROUND LITERATURE REVIEW

All pertinent background data will be reviewed to define the required scope of the RI. Information will be obtained on plant history, potential contaminant sources, site migration pathways, water use, receptors, and potential impact on human health, welfare, and the environment.

This task will be accomplished by an initial site visit that will encompass reconnaissance of both the BES plant and the Borough of Bally. In addition, pertinent EPA, state, and BES files will be reviewed and all applicable information will be reproduced to become part of the project file.

4.2 EVALUATION OF GROUND WATER USERS

With the aid of BES personnel and the Borough of Bally, an evaluation of ground water use in the area will be conducted. Information to be obtained will include an understanding of the municipal wells, definition of ground water withdrawal for industrial use at the Bally Ribbon Mill and the Great American Knitting Mill, and the identification of domestic wells and their use in Bally.

4.3 BASELINE GROUND WATER SURVEY

An evaluation of the aquifer response to ongoing pumping conditions within Bally will be undertaken. This survey will coincide with installation of wellhead treatment and pumping of Bally Well No. 3. The survey will span a four-week period and will commence two weeks prior to air stripping and pumping at Bally Well No. 3. In this manner, data will be obtained prior to and during large scale pumping of the aquifer in the Bally vicinity.

Additionally, daily response from other nearby pumping sources will be evaluated through the survey. To accomplish this task, three continuous

800428

water level recorders will be installed at wells near Bally Well No. 3. Proposed locations include existing well 86-5D, 86-3D, and a well to be drilled during the RI (87-7I). These locations have been shown in Figure 6-1.

Water levels of other wells in the pumping vicinity will also be obtained frequently during pumping and non-pumping conditions to further define the effects of high-volume pumpage on the aquifer and to define capture zone geometry. This task will occur throughout the RI and will determine baseline aquifer conditions. This data will be useful in determining the pumping effects on contaminant distribution and will provide valuable information on ground water recovery potential.

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AR300429

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



5.0 SAMPLING ACTIVITIES - SOURCE DELINEATION AND CHARACTERIZATION

Based upon a review of the operational history of the plant and aerial photographic records (EPIC, August 1986), the potential source areas of contamination appear to be four buried waste storage lagoons and both former and present small parts degreasing areas. The lagoons apparently received spent pickling liquors from metal etching operations from the mid-1950s until about 1969. The degreasing areas have been associated with various industrial solvents containing 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), methylene chloride, and other hydrocarbons. Use of the former degreasing area was from the early 1960s until about 1969. The present degreasing area has been in use at its present location since the early 1960s. Additional details relative to solvent use at the BES plant are provided in Chapter 2.0 of the RI/FS Work Plan.

Figure 5-1 shows the location of the suspected source areas relative to the existing plant structure. Shallow soil sampling will be conducted in all of these areas to document their potential for a release to the ground water system. Table 3-1 summarizes all soil sampling and analysis to be conducted during the RI. In addition, a shallow ground water monitoring well will be installed in the former degreasing tank area to determine volatile organic contamination in this suspected source area. Monitoring well installation is discussed in Chapter 7.0.

5.1 WASTE LAGOON CHARACTERIZATION

5.1.1 Sampling Stations

Subsurface lagoon sampling locations are shown in Figure 5-2 and are labeled SS-1 through SS-8. Analytical samples will be obtained in six-inch increments within the former lagoon, immediately below the lagoon, and two feet below the base of the lagoon and will be designated by the letters A, B, and C, respectively. For example, the three samples collected at Station No. 8 would be respectively identified SS-8-A, SS-8-B, and SS-8-C.

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All locations will be horizontally and vertically located by survey after completion of sampling.

5.1.2 Analytical Parameters

Headspace analysis of the 24 jarred soil samples will be conducted with an OVA to qualitatively determine organic vapor concentration. OVA scanning of the borehole and cuttings will also be routinely conducted during drilling to identify areas of potential contamination. Operation of the OVA is discussed in Appendix A.

Of the 24 collected samples, approximately 8 will be selected for CLP volatiles analysis. Selection will be based on OVA screening. All of the most highly contaminated samples, as well as a representative number of clean samples (i.e., VOC reading less than 5 parts per million [ppm]) will be forwarded for laboratory analysis.

Deeper soil samples will be obtained at Stations SS-1 through SS-4 for the purpose of determining site subsurface conditions. These samples will not be submitted for analytical testing but will be used to determine site geologic conditions. The vertical frequency of geologic sampling will be determined in the field based on site conditions. All samples taken for geologic purposes will be stored at the field command post for possible future reference.

5.1.3 Sampling Methods

Samples at Stations SS-1 through SS-4 will be taken by a geotechnical drill rig taking split-spoon samples through hollow-stem augers in accordance with the American Society for Testing and Materials (ASTM) Method D1546-74. Due to the limited space available, holes at Stations SS-5 through SS-8 will be taken by concrete coring through the plant floor into the subbase material and thence by a bucket auger into the soils beneath the plant to collect the desired samples. Where necessary, a portable power auger will be used to advance the soil boring to the desired sample depth.

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The samples will be transferred from their sampling device into laboratory-certified clean glass jars by use of a stainless steel trowel. All sampling equipment will be decontaminated between each use by pressurized steam cleaning or otherwise as discussed in Section 3.4.

5.1.4 Sample Preservation and Handling

None of the soil samples will require chemical preservation prior to shipment. All collected samples will be stored in insulated coolers after collection. The collers will be packed with prepackaged ice to cool the samples to (approximately) 4 degrees Celsius (°C). The jars will have their lids taped shut and will be separated from each other in the coolers by cardboard dividers. The samples will be packaged and shipped as discussed in Section 3.6.

5.1.5 Replicate Samples

One of the eight samples collected will be blended in the field in a stainless steel bowl and then divided into two replicate samples to determine the effectiveness of field and laboratory procedures. This will result in a total of nine soil samples submitted for analysis from this task. The replicate sampling station will be chosen in the field.

5.2 DEGREASING AREA INVESTIGATION

5.2.1 Sampling Stations

The former degreasing area sampling stations proposed are also shown in Figure 5-2 and are labeled SS-9 through SS-15. The current small parts degreasing area will be investigated by sampling subsurface soils in the vicinity of spent solvent collection (immediately outside the building); sampling inside the current degreasing area is not warranted based upon degreasing and spent solvent handling practices and on the basis of the relatively small size of this area (600-gallon tank versus 2,000-gallon tank at the former degreasing area). The former degreasing area will be investigated by a network of six borings. All of these borings occur within the existing BES Carpentry Shop.

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Sampling at these locations will be taken on a continuous basis to the top of competent bedrock with selected intervals sent for laboratory volatile organics analysis. The selected interval will be defined primarily by OVA readings taken in the field; specific sampling depths cannot be determined at this time. A total of approximately 12 samples and 1 replicate are anticipated from the sampling stations, including those exhibiting the highest VOC, as well as a representative number of clean samples (i.e., VOC less than 5 ppm).

5.2.2 Analytical Parameters

Headspace analysis on all jarred samples will be conducted to determine gross volatile organic content. In addition, drill cuttings and the borehole will be routinely scanned with an OVA as it is advanced. A total of 13 soil samples will be submitted for laboratory CLP volatile organics analyses.

5.2.3 Sampling Methods

All samples will be obtained by a small geotechnical drill rig taking split-spoon samples through hollow-stem augers. Sample collection procedures will be consistent with those described in Section 5.1.3. Sample decontamination procedures will be consistent with those described in Section 3.4.

5.2.4 Sample Preservation and Handling

None of the samples will require chemical preservation prior to shipment. Sample handling will be consistent with those described in Section 5.3.6.

5.2.5 Replicate Samples

One replicate sample will be prepared for this task, following the approach described in Section 5.1.5.

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5.3 SURVEYED LOCATION REQUIREMENT

All borings will be located on plant drawings by field survey in accordance with the general requirements established in Section 3.10.

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6.0 EXPLORATORY DRILLING PROGRAM

6.1 BEDROCK COREHOLE LOCATIONS

One core exploration borehole will be drilled to relate lithologic and fracture characteristics to site hydrogeology. The corehole location (E-1) is shown in Figure 6-1. Depth of the boring will be approximately 200 feet.

6.2 CORING AND LOGGING METHODS

Drilling will proceed by either the wireline coring or by conventional coring methods. Either air or potable water can be used as the drilling medium. If water is used, the borehole will be purged frequently during drilling so that accurate water level measurements are obtained as drilling progresses. If a perched water table is encountered above the main aquifer, it will be temporarily cased off before drilling proceeds. The boring will be logged by an experienced geologist and all core will be placed in wooden core boxes labeled with the site name, project number, boring number, depth intervals, and date.

Upon completion of drilling, the borehole will be logged by downhole geophysical methods to further qualitatively define water-producing zones and to provide insight on contaminant transport within the aquifer. A comprehensive suite of logs will be run including gamma, neutron, resistivity, temperature, gamma-gamma, fluid conductivity, and caliper. The response of the logging equipment will be checked in the field by the geophysical subcontractor, Appalachian Coal Surveys (Pittsburgh, Pennsylvania), using a set of standards that create a known response for a given log. The standard check will be conducted for each log and the response documented prior to and after logging.

After completion of geophysical logging, the borehole will be sealed with a tremied cement/bentonite slurry.

6.3 HANDLING OF DRILL CUTTINGS AND FLUIDS

All drill cuttings generated during the coring operation will be scanned with an OVA. If no elevated (i.e., 5 ppm above background) readings occur, the cuttings will be treated as nonhazardous materials and will be reclaimed consistent with topography and vegetative cover surrounding the borehole. If elevated readings do occur, the cuttings will be drummed and stored at the BES site for appropriate disposal. Water return from the borehole will be collected in a small, lined, manmade sump and will be used in the cement/bentonite slurry that will seal the boring upon completion of data acquisition.

6.4 SURVEYED LOCATION REQUIREMENT

The ground surface location of the corehole will be located horizontally and vertically by survey after borehole sealing in accordance with the general requirements established in Section 3.10.

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7.0 MONITORING WELL INSTALLATION

7.1 WELL LOCATIONS

Thirteen ground water monitoring wells are proposed to further define the vertical and horizontal extent of contamination in the Bally area. The wells are classified as being either shallow, intermediate, or deep with respect to the aquifer. Four cluster well locations will be drilled that will consist of two individual wells installed at variable depths within the aquifer. At one other location, a monitoring well will be installed adjacent to an existing shallow well (86-4) to produce an additional cluster location. The remaining four wells will be installed at various locations and depths within the aquifer so that, when coupled with the data available from the existing monitoring and private wells, a comprehensive assessment of contaminant extent and transport can be conducted. Well locations are shown in Figure 6-1; Table 7-1 summarizes the rationale and anticipated depth of each proposed well location.

7.2 MONITORING WELL CONSTRUCTION PROCEDURES

All wells, except 87-13S, are anticipated to be drilled by air rotary methods. Well 87-13S, which will be drilled inside the plant in the area of former degreasing operations, will be drilled by a small geotechnical drill rig capable of gaining access to this restricted location.

7.2.1 Shallow Monitoring Wells

The shallow monitoring wells are designed to monitor the water quality within the upper 20 feet of the aquifer. These wells will either be constructed of threaded, two-inch, Schedule 40, flush-joint PVC screen and riser or as open boreholes, depending on the competency of the encountered formation.

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"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



Where the characteristics of the formation necessitate two-inch PVC construction, the borehole will be drilled by roller bit of either six- or eight-inch diameter to permit installation of temporary steel casing. Drill cuttings will be collected at five-foot intervals and logged by an experienced hydrogeologist. During the drilling process, water level observations will be made as frequently as necessary to identify the existing hydrogeologic conditions and the water-bearing intervals encountered.

Once the desired screened interval has been determined, the PVC screen and riser will be installed through the cased borehole. A clean, medium-grained sand pack will be emplaced around and up to two feet above the screened interval. The temporary steel casing will be slowly raised from the borehole as the sand pack and other well materials are added. A bentonite pellet seal will be placed atop the sand pack. The seal will be a minimum of two feet thick. A cement/bentonite slurry will then fill the remainder of the borehole annulus to ground surface. The temporary steel casing will then be completely removed from the boring as grouting continues. Well construction details for screened wells are depicted in Figure 7-1.

In areas where the shallow portion of the aquifer occurs within competent bedrock, the monitoring wells will be installed as open boreholes. In this instance, six-inch steel casing will be set and grouted in place a few feet into competent bedrock. After the seal around the casing has had sufficient time to cure, the boring will be advanced with a 5-5/8-inch diameter roller bit 15 to 20 feet below the top of the aquifer. Well construction details for open borehole wells are shown in Figure 7-1.

Borehole logging and water level observation procedures described for the screened wells will also apply for the open borehole wells.

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Monitoring Well 87-13S will be drilled with a geotechnical drill rig because of the restricted space occurring within the former degreasing area (present Carpentry Shop) of the plant. At this location, hollow-stem augering with split-spoon sampling will be conducted to the top of competent bedrock and a 3-7/8-inch diameter roller bit will advance the boring through bedrock. The well will be drilled 10 feet into the saturated zone and will be constructed either as a screened well or open borehole as conditions dictate. If the well is screened, the riser and screen will be constructed of stainless steel due to the potentially-high concentrations of volatile organics in this area.

7.2.2 Intermediate Depth Monitoring Wells

The intermediate depth monitoring wells are designed to monitor organic plume concentrations and vertical head distribution at depths of between 80 to 120 feet within the fractured rock aquifer. These wells will be constructed as open boreholes, as described in Section 7.2.1, with the exception that the cased interval will extend 40 to 60 feet below the top of the saturated zone (i.e., approximately 70 feet below ground surface). The steel casing will either be grouted in place by a tremie line extending to the base of the casing or by pressure grouting by pumping grout from inside the casing up the annulus of the borehole. The grout will consist of a cement/bentonite mixture.

7.2.3 Deep Monitoring Wells

The deep wells will be installed to determine if the contaminant plume is migrating vertically and will monitor water quality at depths of 160 to 200 feet within the aquifer. Well construction procedures will be the same as for those of the intermediate wells, except that the steel casing will be set and grouted to a depth of approximately 160 feet below ground surface.

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7.3 WELL SECURITY

All monitoring wells will be installed with protective locking steel covers to restrict intentional access to the wells. The protective covers can either be installed so that they extend two to three feet above-grade, or they can be installed flush with the ground surface, depending on well location and the wishes of the landowner. Figure 7-1 graphically depicts locking steel covers that extend above the ground surface.

7.4 WELL DEVELOPMENT

All wells will be developed to remove drill cuttings from the borehole and eliminate turbidity. The development process will consist of one or more of the following procedures:

- Airlift Method - Compressed air will be pumped down the borehole causing formation water and cuttings to flow out of the surface of the well. This can be conducted intermittently at varying pressures so that the water can be raised inside the borehole (or casing) and fall back down the borehole (casing) to produce the desired back-flushing action.
- Bailer - A heavy bailer will sink rapidly through the water. It will be raised or lowered through the well screen or open section of the well. The turbulence created within the well bore will achieve development of the well.
- Pumping - A submersible pump (without a bottom check valve) will be pumped at various intervals and rates to produce the desired flushing action.
- Surging - In cased wells, a tight fitting surge block will be raised and lowered through the screened interval to loosen and remove drill cuttings.

The wells will be developed to a turbid-free state for a minimum of one hour. Samples of the water within the well bore will be visually checked for turbidity to establish the endpoint of the development process.

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7.5 HANDLING OF DRILL CUTTINGS AND FLUIDS

All drill cuttings and fluids generated during monitoring well installation (with the exception of 87-13S) will be treated as nonhazardous materials and will be reclaimed consistent with the topography and vegetative cover in the vicinity of the well. For wells on residential property, the landowner will be consulted regarding handling of the cuttings. This is based on the fact that all of these locations are remote from any waste sources and any contamination encountered will be trace levels from the ground water.

At Well 87-13S, the cuttings will be scanned with an OVA to determine if they contain organic contamination. If they are found to be contaminated (i.e., OVA headspace readings in excess of 5 ppm above background), they will be drummed and stored on site at the temporary drum storage area at the BES plant to await proper disposal, in accordance with current BES waste handling practices. Handling and disposition of the drums will be based on laboratory analyses of samples from the soil borings and ground water in this vicinity.

7.6 SURVEYED LOCATION REQUIREMENT

All wells will be located horizontally and vertically by survey so that accurate ground water flow direction can be assessed and the wells can be accurately plotted on the site base map. Surveying of the wells will be consistent with Section 3.10. In addition to the ground elevation, the top of the protective cover stickup will also be surveyed to the nearest 0.01 foot at each location.

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8.0 AQUIFER PERFORMANCE TESTING

The aquifer performance testing to be conducted at the BES site will determine site-specific aquifer parameters and capture zone geometry. These tests will help to determine the location and number of ground water recovery wells necessary for aquifer renovation should it become necessary to undertake such action to enhance aquifer cleanup beyond that provided by pumping of Bally Well No. 3 with treatment.

8.1 TEST METHODOLOGY

Initially, a suitable pumping well will be established for the test. Based upon existing conditions, the well chosen must be in excess of 200 feet deep, have a relatively good yield, and a suitable surrounding observation network. At the present time, Bally Well No. 3 appears to be a suitable pumping well based upon the above factors and its proximity to the contaminant plume. Approval is anticipated in the near future from the Pennsylvania Department of Environmental Resources (PADER) for pumping Bally Well No. 3 with treatment as a supplement to the Bally municipal water supply. Use of this well for an aquifer pumping test will be contingent upon additional municipal and regulatory approval.

Once a pumping well is chosen, a step drawdown test will be conducted, if necessary, to determine the most favored pumping rate. This test consists of pumping the well at successively higher pumping rates for a short duration (one to two hours) and recording the drawdown or step for each rate. At least five steps will be used; the water level will be permitted to recover to static conditions after each step.

After determination of an effective pumping rate, a long-term, continuous pumping test will be begun. The test length will depend upon the created cone of influence, but pumping should continue for 48 to 72 hours with a water level recovery period nearly as long. During this time, water levels will be recorded at the pumping and all of the observation wells. Pressure transducers coupled to data recorders will be

utilized to obtain constant measurements of the pumping well and nearest observation wells. Outlying wells will be measured manually with an electronic water level indicator.

Measurements at observation wells will be taken frequently in the beginning of the test (every five minutes) and at progressively longer intervals (up to once every few hours) as the test lengthens and the cone of depression expands. During the recovery period, the initial measurements of recovery will be taken frequently, with progressively longer intervals between measurements as the recovery period progresses.

Discharge of pumping water will be measured at frequent intervals to ensure a consistent withdrawal from the aquifer. The measurements will not vary over more than five percent of the required pumping rate established in the step test. Discharge rates will be recorded during each measurement. Measurements will be made by using either a flow meter or orifice weir, depending on well yield and field conditions.

Upon completion of the test, the data will be reduced and analyzed using the Jacob Straight-Line Approximation Method. Both time drawdown and distance drawdown graphs will be constructed to determine aquifer characteristics.

8.2 HANDLING OF DISCHARGE WATER

In concert with use of Well No. 3 as an alternate water supply, a surface water discharge (i.e., NPDES) permit will have been obtained from the PADER, Bureau of Water Quality (BWQ), for discharge of water removed, but not used to supplement the borough water supply. The requirements of this permit will also be complied with during the pumping test, should Bally Well No. 3 be approved as the pumping well. In the event that an alternative pumping well must be selected, appropriate temporary discharge authorization will be obtained from the PADER.

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9.0 SURFACE AND GROUND WATER SAMPLES

9.1 SAMPLING STATIONS

All existing (7) and proposed (13) monitoring wells as well as the previously sampled private municipal (2), residential (9), and industrial (3) wells will be sampled. Locations are shown in Figure 9-1. Additionally, a surface water sample will be taken of the wetlands northeast of the BES plant.

9.2 PARAMETERS

All aqueous samples will be analyzed for CLP volatile organics; the municipal wells will also be analyzed for acid and base/neutral (ABN) extractable organics.

9.3 GROUND WATER SAMPLING METHODS

All monitoring wells and the existing on-site well will be sampled one week after well development is completed. Three to five well volumes of water will be purged from each well before sampling. Measurements of pH and conductivity will be taken periodically during well purging. Purging of the wells may include use of a submersible pump, suction pump, and bailers depending on such factors as depth to water table, diameter of well, and volume to be purged. All purging equipment will be decontaminated by pressurized steam prior to and between each use. All drop or sampling lines will be discarded after each use.

Sample logging and chain-of-custody procedures will be strictly adhered to during all phases of sample acquisition, handling, and shipping. At this time, 25 samples are anticipated (Table 3-1) from the monitoring well network. This number includes sampling and analysis of the plant site well and appropriate numbers of quality control samples as specified in the table.

The 13 remaining private municipal and industrial wells previously sampled (1983 and 1986) will be sampled concurrently with the monitoring wells and analyzed for CLP volatile organics; samples drawn from the

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municipal wells will also be analyzed for ABN organics. The samples will be collected at the tap nearest the pump outlet. Measurements of pH, conductivity, and temperature will be taken during well evacuation until stable readings are obtained; it is anticipated that each well will be purged for approximately five minutes prior to sampling. A duplicate and blank sample will be prepared for this group of samples as well.

Monitoring wells 86-1 and 86-2 will be used as on-site background water quality wells. Based on existing data indicating ground water flow to the northeast and past sampling results showing no detectable levels of contaminant, these wells are considered to be representative of background water quality. In addition, several off-site residential wells that have not shown detectable levels of contaminants and appear to be beyond the limits of the ground water contaminant plume will be used to further define background water quality. These wells include:

- Nace
- Smith
- Kehs Brothers
- Moser
- Farm Products.

9.4 SURFACE WATER SAMPLING METHODS

Surface water will be sampled at a single location within the manmade wetland immediately northeast of the BES plant. Topography limits the potential for storm water runoff to the wetland from the BES. The source of water for the wetland plant site appears to be from springs and surface drainage to the north of Well No. 3. Surface water sampling has been incorporated in this program to verify that volatile organics are not present in excess of Ambient Water Quality Criteria (AWQC), especially for the contaminants of interest (i.e., 1,1,-TCE, 1,1-dichloroethene [DCE], and tetrachloroethylene [PCE]).

A surface water sample will be collected directly into a laboratory-certified clean sample jar from the more predominant of the diffuse flows across the surface of the wetland. The actual sampling location

AR300445

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



will be defined in the field. The sample location will be marked at the time of sampling with a wooden stake. Surveyed coordinates will be provided for this point per Section 3.10.

9.5 SAMPLE PRESERVATION AND HANDLING

A summary of analytical methods, preservation techniques, holding times, and method detection limits is presented in Table 3-2.

All ground water samples will be transferred from laboratory-certified clean Teflon or stainless steel bailers into the appropriate sample containers upon collection. Surface water samples will have been collected directly into the sample containers. All samples will be handled and processed per Section 3.6.

After preparation, all bottles will be packed on ice in sample coolers that will be sealed prior to shipping. Chain-of-custody forms will be prepared documenting sampling times and custody and will accompany the samples to the laboratory. Signed chain-of-custody seals will be placed over the cooler lid prior to shipment. The samples will be air-expressed to the laboratory within 24 hours of collection.

9.6 REPLICATE SAMPLES

One replicate sample will be included for the monitoring well and residential well sampling. A replicate sample will also be obtained at the surface water sampling location

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10.0 QUALITY ASSURANCE/QUALITY CONTROL

10.1 FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE

10.1.1 Field Calibration

In addition to the laboratory analyses conducted during the course of this investigation, field measurements of VOC, pH, specific conductance, and/or temperature will be made for specific soil, ground water, and surface water samples.

Field calibration procedures will, at a minimum, include the following. Specific information relative to field operation and calibration of the electronic instrumentation is included in Appendix A.

- The pH and specific conductance meters will be calibrated a minimum of once daily and documented in the calibrator's field notebook. Calibration will be checked as necessary to ensure that proper measurements are taken.
- pH meters will be calibrated using specific techniques according to the manufacturer's instructions and two standard buffer solutions (4, 7, or 10) obtained from chemical supply houses. The pH values of these buffers will be compensated for temperature according to the values supplied on the manufacturer's bottle label. The temperature (measured as below) at which the sample pH was measured will then be used to compensate for temperature on the meter.
- Temperature measurements will be performed using field thermometers calibrated at 10°C and 45°C to a National Bureau of Standards (NBS) specification thermometer. Correction factors will be clearly marked on each individual thermometer, and the corrected data recorded as the raw measurement in °C. This level of accuracy is believed sufficient for the temperature measurements required.
- Specific conductance meters will be calibrated using a standard potassium chloride (KCl) solution. The conductivity probe cell constant will be calculated according to the procedure outlined in Appendix A.

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- The HNU (OVA) will be calibrated daily using the procedure outlined in Appendix A.

As a minimum, calibration shall be performed daily before use. If conditions warrant calibration will be performed periodically during the day. All results will be documented in the calibration log.

10.1.2 Preventive Maintenance

Remcor's field equipment is maintained through the use of field check summary sheets that identify the most recent maintenance, battery charge, and condition of the equipment. When damaged equipment is returned to the equipment supply room, it is appropriately flagged for the required repairs or maintenance needed. This process assures that only operable and maintained equipment enters the field. Routine daily maintenance procedures conducted in the field include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems
- Cleansing of filters in an OVA
- Storage of equipment away from the elements
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g., cracked or clogged lines or tubing or weak batteries).

Spare and replacement parts stored in the field to minimize downtime include:

- Appropriately sized batteries
- Locks
- Extra sample containers
- Bailer line
- Bailers
- HNU calibration kit, battery charger, and support equipment
- Tool kit.

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Monitoring equipment is seldom repaired in the field; rather, Remcor has the capability to mobilize replacement instruments to the BES site within 24 hours, should the need arise.

10.2 QUALITY CONTROL FOR ANALYTICAL DATA

This section defines the program to be used by Remcor in acquiring and evaluating analytical data to ensure that the resulting data base is developed consistent with the DQOs established in Section 3.2 of the RI/FS Work Plan. Aspects of data quality control include quality control samples, performance and system audits, validation of data, and means of calculating DQOs relative to precision, accuracy, and completeness of the data.

10.2.1 Quality Control Samples

10.2.1.1 Field

Field quality control samples have been identified by medium and sampling tour in Table 3-1, consistent with EPA guidance (EPA, March 1987). These samples include the following:

Blank Samples

Blanks are prepared from media known to be free of contaminants of interest and are submitted to the laboratory as blind samples (i.e., no identification as a blank). Handling and processing of blank samples will be identical to that of samples of environmental media collected in the RI. Blank media will consist of the following:

- Aqueous samples: deionized water, obtained from NUS and certified by analysis from NUS to be free from contaminants of interest
- Soils: autoclaved potting soil.

Field blanks will be prepared in the field, while trip blanks will have been prepared by NUS and will accompany sample jars to the field and will be returned with environmental samples to the lab. One field blank

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AR300449

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



will be required for each sampling event (e.g., source characterization, surface and ground water sampling) and each medium sampled (i.e., aqueous and soil). Separate trip blanks will be required for each shipment to the laboratory, irrespective of the number samples collected. For example, soil samples collected in the source characterization task may require two separate shipments to the laboratory to avoid the possibility of violating sampling handling times prior to extraction. A total of two trip blanks and one field blank would be required for this sampling event.

In addition to the above blanks, rinsate blanks will be prepared for ground water samples collected from monitoring wells via bailers. The purpose of the rinsate blank is to ensure that no extraneous contamination enters the sample via the sample collection equipment. Dedicated bailers will be used to collect samples from the monitoring wells; that is, no decontamination will be required in the field. A rinsate blank sample will be collected by passing deionized water through a bailer dedicated to the blank sample. All sample preparation will exactly duplicate that otherwise employed for environmental samples. One rinsate blank sample will be required for the monitoring well sampling event.

Field Replicate Samples

Field replicates are collected to provide an indication of error introduced in the laboratory analysis. The term "replicate" has been used rather than "duplicate". Every effort will be made to limit variability between these samples; however, it must be acknowledged that collection of truly duplicate (i.e., no variability) samples is rarely achieved. Assuming that little or no variability is introduced in the acquisition and processing of replicate samples, the variation in analytical results for such samples may be attributed primarily to the laboratory. Field replicates are also submitted as blind samples.

In accordance with the DQO Guidance (EPA, March 1987), one replicate sample will be collected for every 20 environmental samples (i.e., 5 percent), or portion thereof, from each medium sampled.

10.2.1.2 Laboratory

Laboratory quality control samples will include laboratory duplicates and matrix spikes. Quality control procedures to be followed by NUS are in conformance with those specified in the most current CLP Statement of Work for Organics Analysis (CLP, July 1987). All quality control results will be reported to Remcor with the analytical data packages, and will be evaluated in the data validation process.

10.2.2 Performance and System Audits

10.2.2.1 Performance Audits

Matrix spikes and blanks will be used to evaluate the performance of NUS in analyzing samples in the RI. In general, no project-specific system audit of the laboratory is required because NUS is a participating CLP laboratory and is therefore subject to CLP audit requirements.

10.2.2.2 System Audits

System audits will be performed by or under the direction of the Remcor Quality Assurance Officer to evaluate field sampling activities, including source characterization (i.e., soil sampling), monitoring well drilling and installation, installation and use of continuous water level recorders, and surface and ground water sampling. A total of four system audits will be conducted at appropriate points within the RI to monitor the above activities.

An on-site system audit will be performed to review all field-related quality assurance activities. The system audit will be conducted by the Remcor Quality Assurance Officer.

Specific elements of the on-site audit include the verification of:

- Completeness and accuracy of sampling chain-of-custody forms, including documentation of times, dates, transaction descriptions, and signatures
- Completeness and accuracy of sample identification labels, including notation of time, date, location, type of sample, personnel, preservation, and analytical procedure required
- Completeness and accuracy of field notebooks, including documentation of times, dates, drillers' names, sampling methods, sampling locations, number of samples, sampling personnel, types of samples, field measurements, soil logs, and any problems encountered during sampling.
- Adherence to health and safety guidelines outlined, including wearing of proper protective clothing.
- Adherence to decontamination procedures outlined.
- Adherence to sample collection, preparation, preservation, and storage procedures outlined.

10.2.3 Data Reduction, Validation and Reporting

Upon receipt of results from NUS, Remcor personnel will be responsible for transcribing the data into tables suitable for use in data validation. This effort will be performed under the direction of the Remcor project manager, who will be responsible for ensuring that no errors are introduced in the transcription.

Data validation will be performed under subcontract to Remcor, by Support Systems, of Fort Collins, Colorado. Validation will be performed in strict compliance with "Laboratory Data Validation - Functional Guidelines for Evaluating Organics Analyses" (EPA, April 1985). Upon completion of data validation and approval of such validation by EPA Region III, analytical data tables will be prepared showing all appropriate qualifiers.

NUS Laboratories will maintain analytical data generated pursuant to the BES RI on magnetic tape (MS data) and floppy disks (GC data) for a period of four years from the date of analysis. This data can be retrieved at any point for further review and preparation of hard copy.

10.2.4 Data Quality Criteria (Precision, Accuracy, and Completeness)

10.2.4.1 Field Measurements

Historic data are not available to be used as a basis for establishing quantitative criteria. However, precision, accuracy, and completeness will be calculated for all field measurements obtained in the RI. This section provides the bases for such calculations. Field instruments for environmental measurements to be used include an OVA, pH meter, conductivity meter, and field thermometer.

Accuracy

Accuracy is defined as proximity to the known value; in all cases in the RI the known value will be a standard used in the the calibration of the instrumentation. Accuracy is measured as percent bias, by the following equation:

$$\left(\frac{X-K}{K} \right) \times 100\%$$

where:

X = the mean value of a series of measurements

K = the known value, or calibration standard

It is important to know the percentage by which field instrument readings are either consistently lower (negative bias) or higher (positive bias) than the known value. The procedures to be used in calibrating each of the field instruments are discussed in Section 10.1.1 and Appendix A. Measurements of the accuracy of the instrument will be made by first calibrating the instrument and then making a series of ten measurements on the calibration standard. The deviation of the average of

AR300453

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



these ten measurements from the standard value, expressed as a percentage, will be recorded as the bias for that sampling effort. Accuracy of the field instrument will be checked with each recalibration, as required.

Precision

Precision reflects the "reproducibility" of a series of measurements made with an individual instrument under specific conditions. Precision will be reported as the standard deviation of a data set from the mean value for that set, in accordance with the following equation, summing the variations of each of the observations from the group mean and dividing by an appropriate number of degrees of freedom.

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$

where:

s = sample standard deviation

$\sum_{i=1}^n$ = summation from the first through the nth value

n = number of observations

x_i = the ith individual observation

\bar{x} = the mean value of all n observations

n-1 = number of observations minus 1 (degrees of freedom)

Completeness

Completeness of the data set is expressed as the number of completed analyses versus the number attempted per the following equation:

$$\left(\frac{x}{y}\right) \times 100\%$$

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where:

x = number of measurements completed

y = number of measurements attempted

10.2.4.2 Laboratory

Data quality criteria for all laboratory measurements will be calculated in accordance with the most current CLP Statement of Work for Organic Analyses (CLP, July 1987).

10.3 DOCUMENTATION

Documentation of all activities will include a site logbook (including site visitors log sheet), field notebooks, labels, custody seals, chain-of-custody forms, corrective action forms, and field instrument calibration forms. The sampling team will keep waterproof field notebooks containing information on sample number, sample collection, time, sample location, sample description, sampling methods, weather, in situ measurements, and other pertinent information. Examples of all necessary forms have been included in Appendix B. Additional discussion of field recordkeeping may be found in Sections 3.7 and 3.8 of the site-specific HSAP.

10.4 CORRECTIVE ACTION

10.4.1 Corrective Action - Remcor

Field quality assurance activities will be reported to the project manager and quality assurance officer. Problems encountered during the study affecting quality assurance will be reported. The project manager/quality assurance officer will be responsible for initiating the corrective actions and for insuring that the actions are taken in a timely manner, and that the desired results are produced.

All corrective action taken will be reported to the EPA Project Officer as part of the RI/FS report.

AR300455

10.4.2 Corrective Action - Laboratory

Corrective actions for the laboratory analytical work will be consistent with the NUS Laboratories internal quality control program and most current Statement of Work for Organics Analysis (CLP, July 1987). NUS will provide documentation as to what, if any, corrective actions were initiated.

10.4.3 Contingency Plan

If it becomes necessary to modify a program, the QA officer will notify the project manager of anticipated and/or immediately mandated changes. The significance of actions taken in the field will be evaluated and documented in writing by the lead investigator or site superintendent.

10.5 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The project manager, in conjunction with the QA officer, will submit in the investigation reports, summaries of all applicable quality assurance activities. These summaries shall contain at least the following types of information:

- The status and coverage of various laboratory and field quality assurance project activities
- Data quality controls including assessment of accuracy, precision, completeness, representativeness, and comparability
- Significant quality assurance problems discovered, corrective actions taken, progress and improvements, plans, and recommendations for further implementation or updating of the investigative QAPMP
- Any significant irregularities noted in the field notebook during the sampling procedure
- Results of performance and system audits, if conducted.

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"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



QA Reports will be provided as completed; however, summaries of the QA reviews will be provided at least monthly as part of the monthly status report required by the ACO (EPA, January 18, 1987).

AR300457

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REFERENCES

LIST OF REFERENCES

Remcor, Inc., September, 1987a, Site-Specific Health and Safety Plan - Bally Engineered Structures Site, Remcor, Inc., Pittsburgh, Pennsylvania.

Remcor, Inc., September 1987b, Remedial Investigation/Feasibility Study Work Plan - Bally Engineered Structures Site, Bally, Pennsylvania, Remcor, Inc., Pittsburgh, Pennsylvania.

Spotts, Stevens, and McCoy, Inc., July 1975, "Topographical Survey - Borough of Bally," Spotts, Stevens, and McCoy, Inc., Reading, Pennsylvania.

U.S. Environmental Protection Agency (EPA), December 29, 1980, "Interim Guidelines for Preparing Quality Assurance Project Plans," EPA Publications Center, Washington, DC.

U.S. Environmental Protection (EPA), November 1984, "EPA NEIC Policies and Procedures Manual," EPA Document No. EPA-33-/9-78-001-R, (original issue, May 1978), EPA Publications Center, Washington, DC.

U.S. Environmental Protection Agency (EPA), April 1985, "Laboratory Data Validation - Functional Guidelines for Evaluating Organics Analysis," EPA Publications Center, Washington, DC.

U.S. Environmental Protection Agency (EPA), Environmental Photographic Interpretation Center (EPIC), August 1986, Site Analysis -- Bally Case and Cooler, Bally, Pennsylvania, Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

U.S. Environmental Protection Agency (EPA), Region III, January 28, 1987, "Administrative Order by Consent in the Matter of Bally Groundwater Contamination, Bally Engineered Structures, Inc., Respondent," USEPA Region III, Philadelphia, Pennsylvania.

U.S. Environmental Protection Agency (EPA), July 1987, "Statement of Work for EPA Contract Laboratory Program," USEPA Annapolis Laboratory, Annapolis, Maryland.

TABLES

AR300460

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"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



TABLE 3-1
ANALYTICAL SAMPLE SUMMARY
BALLY ENGINEERED STRUCTURES RI/FS

SOURCE	ANALYTICAL PARAMETERS	NO. OF SAMPLES	FIELD ANALYSIS		NO. OF SAMPLES	LABORATORY ANALYSIS				TOTAL LABORATORY ANALYSES
			NO. OF SAMPLES/ PROTOCOL	24 Headspace OVA (2)		FIELD BLANKS	TRIP BLANKS	RINSE BLANKS	FIELD REPLICATES	
Former Waste Lagoons	Soil CLP(3) Volatiles VOC(1)	24	-	-	8	-	1	-	-	-
Degreasing Areas	Soil Soil VOC	28	-	28 Headspace OVA	-	-	-	-	-	11
Monitoring Wells	Ground Water CLP Volatiles	20	-	-	12	1	1	-	1	15
Plant Site Wells	Ground Water CLP Volatiles	1	-	-	20	1	1	1	1	24
Residential Wells	Ground Water CLP Volatiles	9	-	-	1	-	-	-	-	1
Municipal Wells	Ground Water Ground Water CLP Volatiles CLP ABN (1)	2 2	- -	- -	9	1	1	-	1	12
Industrial Wells	Ground Water CLP Volatiles	2	-	-	2	-	-	-	-	2
Wetland	Surface Water CLP Volatiles	1	-	-	1	-	-	-	-	2
TOTALS		89	52	-	57	5	4	1	5	72

- (1) "VOC" indicates volatile organic compounds.
(2) "OVA" indicates organic vapor analyzer.
(3) "CLP" indicates Contract Laboratory Program.
(4) "ABN" indicates acid and base/neutral extractable organics.

SOURCE: Remcor, Inc., Pittsburgh, Pennsylvania, September 1987.

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TABLE 3-2
SUMMARY OF ANALYTICAL METHODS AND PROTOCOL
SOIL AND WATER ANALYSIS
BALLY ENGINEERED STRUCTURES RI/FS

PARAMETER	SAMPLE CONTAINER	PRESERVATION REQUIRED	MAXIMUM HOLDING TIME	METHOD DETECTION LIMIT
<u>CLP Organics</u>				
Volatiles (Soil)	2 x 4-oz widemouth amber glass jars with Teflon-lined caps	Cool to 4°C	10 days	5 to 10 µg/l ⁽¹⁾
Volatiles (Water)	3 x 40-ml glass VOA vials with Teflon-lined septum	Cool to 4°C	10 days	5 to 10 µg/l
Acid, Base/ Neutral Extractables	1 x 1/2-gallon, amber glass jars with Teflon-lined caps	Cool to 4°C	5 days	10 to 50 µ/l

Notes:

All laboratory analyses will be performed in accordance with the most current CLP "Statement of Work for Organics Analysis" (EPA, July 1987).

(1) Method Detection Limit is equal to the CRDL (Contract Required Detection Limit); values reported reflect the range of CRDLs within each fraction; CRDLs for medium level soils are 125x those listed.

Source: Remcor, Inc., Pittsburgh, Pennsylvania, September 1987.

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TABLE 7-1
PROPOSED MONITORING WELL SUMMARY
BALLY ENGINEERED STRUCTURES SITE RI/FS

WELL NO.	MONITORED ZONE	PROPOSED DEPTH ⁽¹⁾ (feet)	RATIONALE
87-4I	Intermediate	120	Determine vertical distribution of plume near source (compare to 86-4S)
87-6I	Intermediate	120	Define extent of plume in northern direction
87-7S	Water Table	50	Determine vertical gradient and distribution of plume between Municipal Well Nos. 1 and 3
87-7I	Intermediate	120	
87-8I	Intermediate	120	Determine northeast extent of plume
87-9S	Water Table	50	Determine vertical gradient and distribution of plume east of the site
87-9I	Intermediate	120	
87-10I	Intermediate	50	Determine plume concentrations downgradient of site (compare to Gehman well)
87-10D	Deep	220	
87-11S	Water Table	50	Determine vertical gradient and distribution of plume in the eastern vicinity of site
87-11I	Intermediate	120	
87-12D	Deep	220	Determine vertical distribution of contamination near source (compare between 86-3 cluster and Municipal Well No. 3)
87-13S	Water Table	40	Determine concentration of volatile organics in suspected source area

(1) Actual well depth may vary and is dependent on intercepting water producing fractures.

SOURCE: Remcor, Inc., Pittsburgh, Pennsylvania, September 1987.

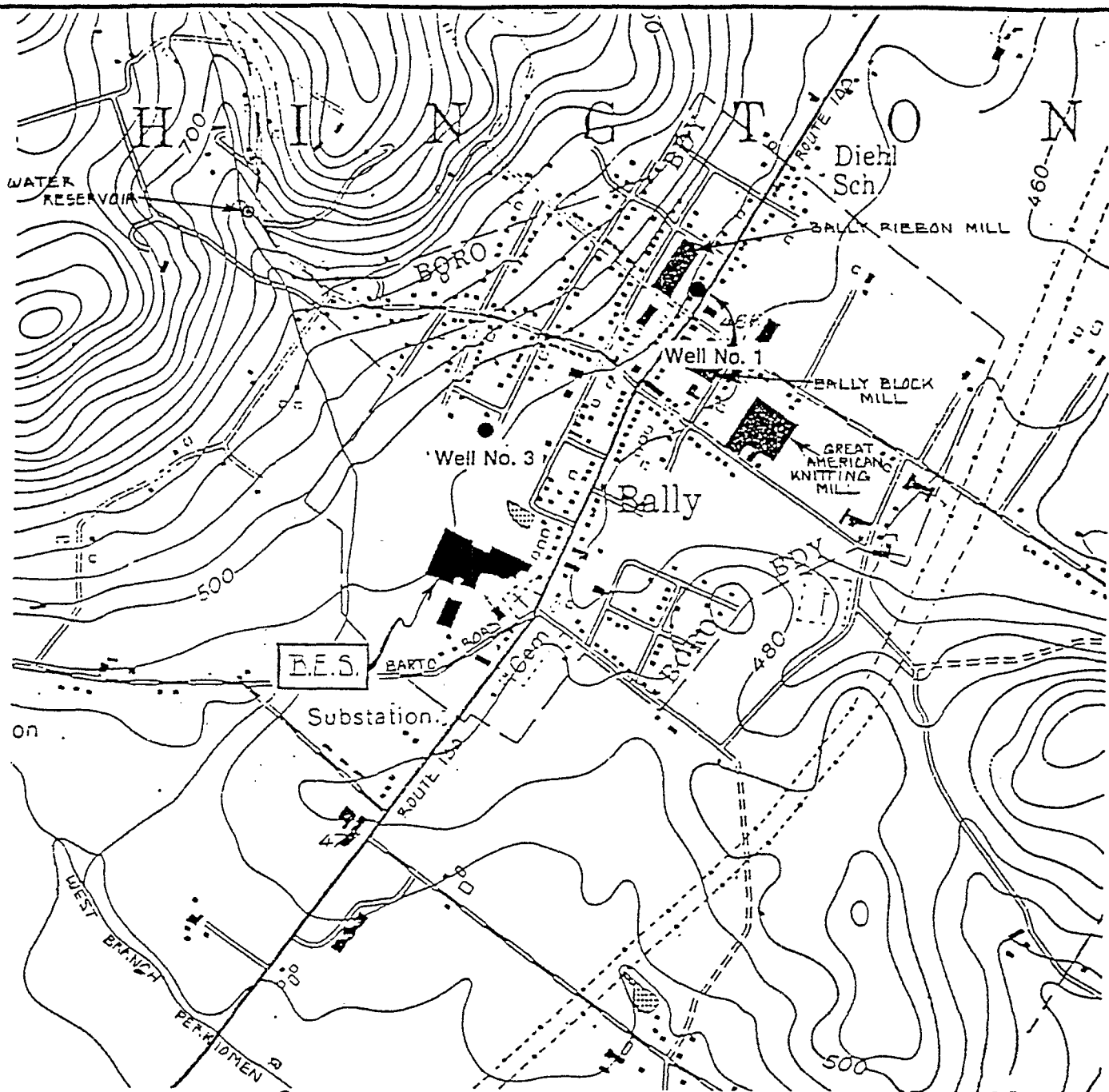
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FIGURES

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0 1000 2000
Scale in Feet

REFERENCE:

U.S.G.S. TOPOGRAPHIC QUADRANGLE
EAST GREENVILLE, PENNSYLVANIA.

LEGEND:

- WELL NO. 1 - DENOTES BOROUGH OF
BALLY MUNICIPAL WELL

FIGURE I-1

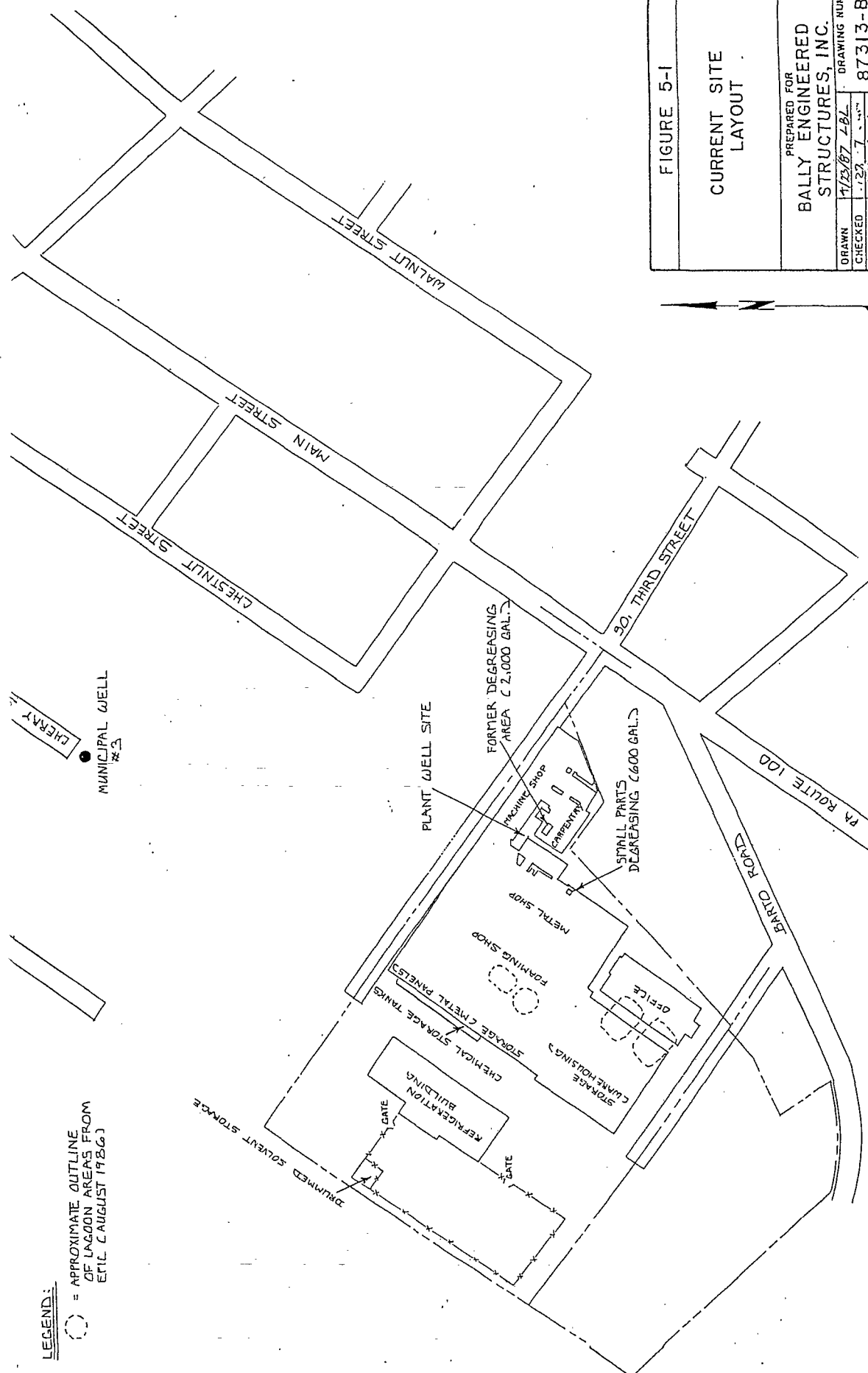
SITE LOCATION
MAP

PREPARED FOR
BALLY ENGINEERED
STRUCTURES, INC.

DRAWN	4/14/87 LBL	DRAWING NUMBER
CHECKED	4/16/87 JAG	87313-A5
APPROVED	IME 4/28/87	

REMCOR 265

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LEGEND:

○ = APPROXIMATE OUTLINE OF LAGOON AREAS FROM ETEL (AUGUST 1986)

REFERENCE:

PLANT DETAIL FROM B.E.S. DWG. NO. 2-78-196, DATED 3-8-78.

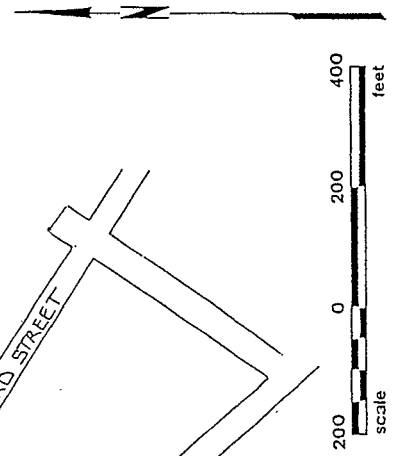
FIGURE 5-1

CURRENT SITE LAYOUT

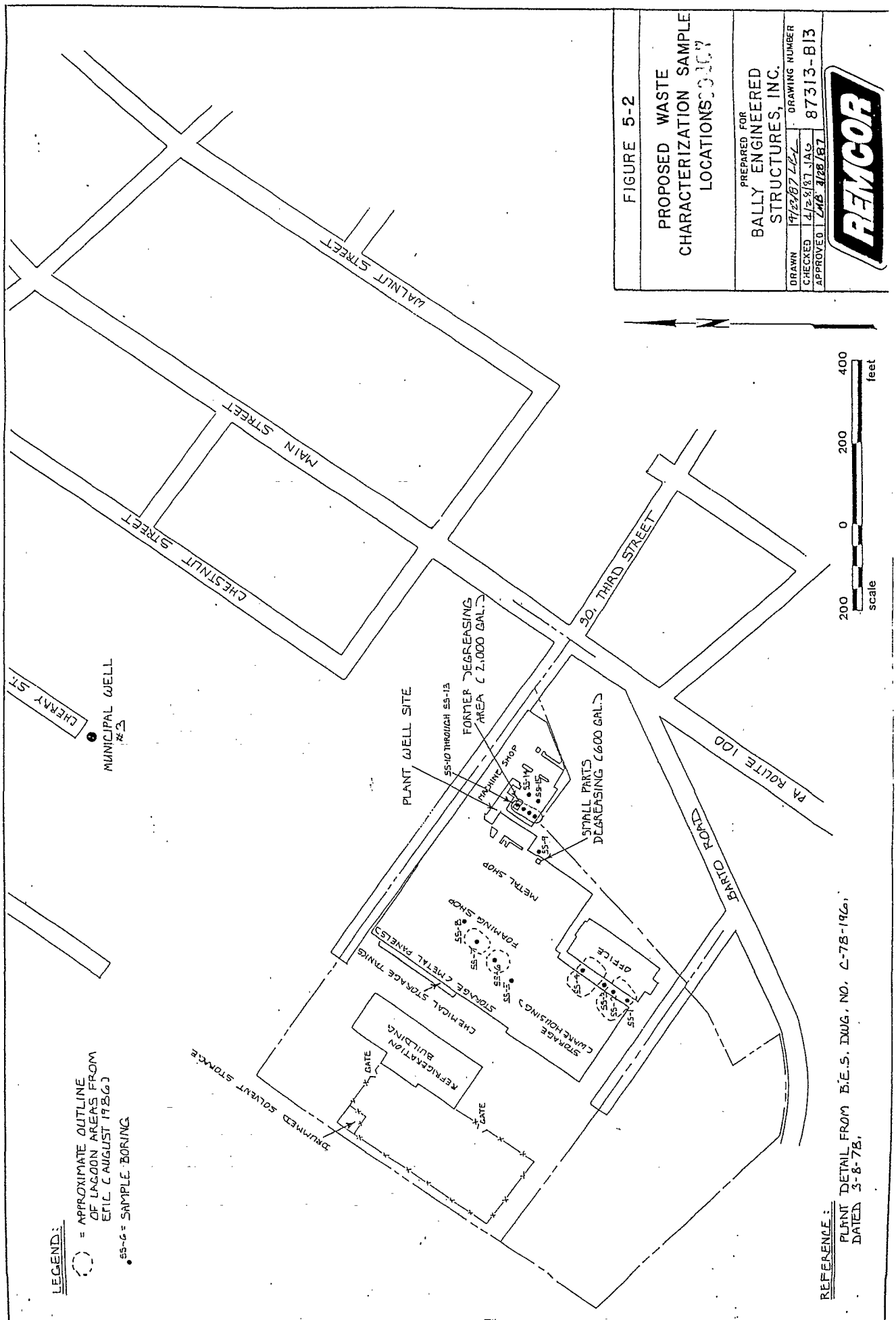
PREPARED FOR
BALLY ENGINEERED STRUCTURES, INC.

DRAWN	1/13/87	LAB	DRAWING NUMBER	87313-B12
CHECKED	1/22/87	LAB		
APPROVED	2/18/87	LAB		

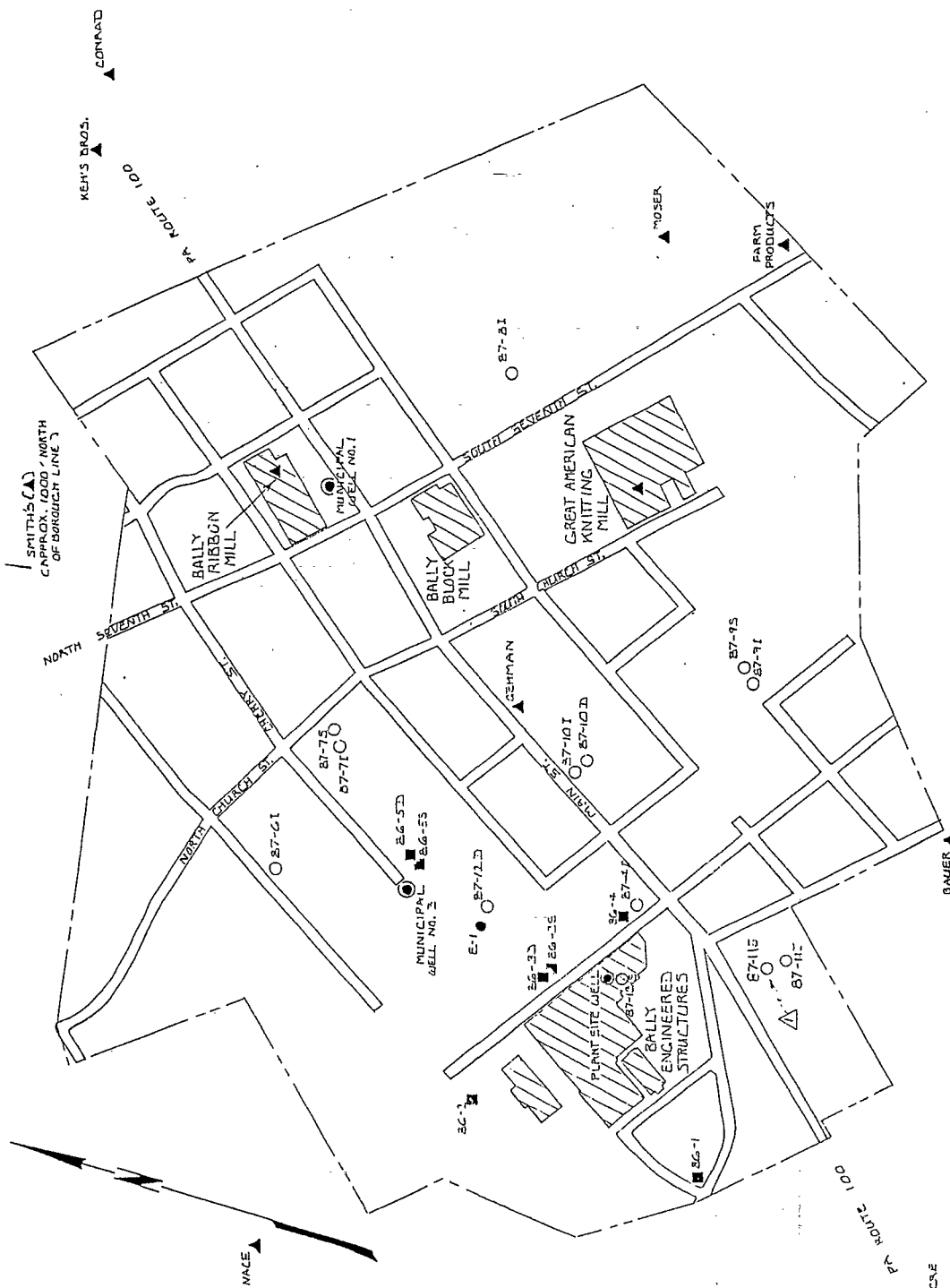
REMCOR



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LEGEND:

- 86-2 = ERM MONITORING WELL
- NAME = OFF-SITE WELL LOCATION
- BOROUGH LINE
- 87-10 PROPOSED MONITORING WELL
- 87-11 SHALLOW
- 87-12 INTER-MEDIATE
- 87-13 DEEP
- E-1 EXPLORATION CORE HOLE

NOTE:

ERM WELL NOMENCLATURE DOES NOT CORRELATE EXACTLY WITH THAT OF THE PROPOSED WELLS. ERM WELLS 86-1, 86-2, 86-3, 86-4 AND 86-55 ARE SHALLOW WELLS UNDER THE PROPOSED SYSTEM, WHILE 86-3D AND 86-5D APPROXIMATE INTER-MEDIATE DEPTH WELLS.



FIGURE 6-1

PROPOSED BORING AND MONITORING WELL LOCATIONS

PREPARED FOR
BALLY ENGINEERED STRUCTURES, INC.

DRAWN	4/23/87 LBL	DRAWING NUMBER	87313-B14
CHECKED	1/28/87 JAG		
APPROVED	1/18/87		



REFERENCE:
SAMPLE LOCATIONS FROM ERM PHASE II REPORT (FUNK AND SMITH, OCT. 27, 1986).
BASE MAP FROM TOPOGRAPHICAL SURVEY, BOROUGH OF BALLY (1975).

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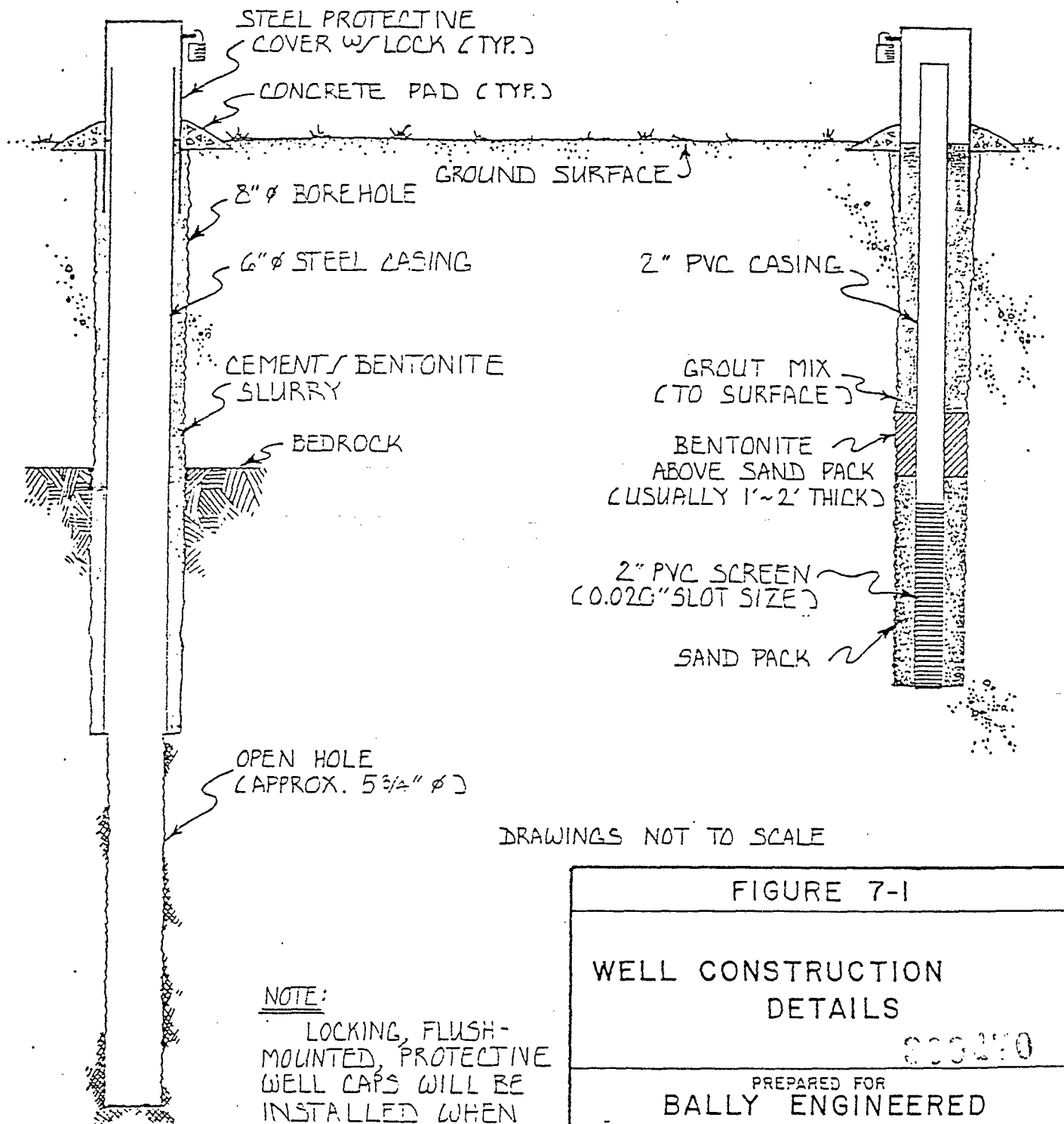
REVS. Δ 0 87-115 87-112 87-111 87-110 87-109 87-108 87-107 87-106 87-105 87-104 87-103 87-102 87-101 87-100 87-99 87-98 87-97 87-96 87-95 87-94 87-93 87-92 87-91 87-90 87-89 87-88 87-87 87-86 87-85 87-84 87-83 87-82 87-81 87-80 87-79 87-78 87-77 87-76 87-75 87-74 87-73 87-72 87-71 87-70 87-69 87-68 87-67 87-66 87-65 87-64 87-63 87-62 87-61 87-60 87-59 87-58 87-57 87-56 87-55 87-54 87-53 87-52 87-51 87-50 87-49 87-48 87-47 87-46 87-45 87-44 87-43 87-42 87-41 87-40 87-39 87-38 87-37 87-36 87-35 87-34 87-33 87-32 87-31 87-30 87-29 87-28 87-27 87-26 87-25 87-24 87-23 87-22 87-21 87-20 87-19 87-18 87-17 87-16 87-15 87-14 87-13 87-12 87-11 87-10 87-09 87-08 87-07 87-06 87-05 87-04 87-03 87-02 87-01 87-00



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OPEN-BOREHOLE WELL

SCREENED WELL



DRAWINGS NOT TO SCALE

NOTE:

LOCKING, FLUSH-MOUNTED, PROTECTIVE WELL CAPS WILL BE INSTALLED WHEN CONDITIONS DICTATE THAT A WELL CANNOT EXTEND ABOVE GROUND SURFACE.

FIGURE 7-1

WELL CONSTRUCTION DETAILS

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PREPARED FOR
BALLY ENGINEERED
STRUCTURES, INC.

DRAWN 4/23/87 LBL
CHECKED 2/28/87 JAL
APPROVED LALB 4/28/87

DRAWING NUMBER
87313-A7

AR300470



APPENDIX A
FIELD INSTRUMENT OPERATION/CALIBRATION

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AIR QUALITY MONITORING FIELD INSTRUMENTATION

MSA MINIGUARD II LEL/O₂ METER

The LEL/O₂ meter will be used to monitor boreholes during drilling operations. Operation and calibration procedures are as follows:

- Turn instrument on and allow to stabilize

If a low battery is indicated by "Batt", charge the battery 12-14 hours prior to use or calibration.

- Press "reset" to cancel alarms
- Connect calibration gas to instrument (Pentane 0.75 percent, Oxygen 15 percent)
- Adjust readouts to correspond to calibration gas, per manufacturer's instructions accompanying the meter
- Check reading in fresh air (i.e., ambient) to ensure proper readings
- Commence monitoring
- Alarms sound for both functions (LEL or oxygen deficiency) no matter which is displayed.

Action levels and monitoring procedures will be followed as stated in Chapter 7.0 (Air Monitoring) of the site-specific HASP.

HEALTH AND SAFETY MONITORING EQUIPMENT

HNU ORGANIC VAPOR ANALYZEROperating Procedures

- Connect the probe cable plug to the 12-pin keyed socket on the readout assembly panel. Carefully match the alignment slot in the plug to the key in the connector. Screw down the probe connector until a distinct snap and lock is felt.
- Screw the probe extension into the probe end cap. The probe may be used without the extension if necessary.
- Set the SPAN control for the probe being used (10.2, 9.5, or 11.7 eV) as specified by the initial factory calibration or by subsequent calibrations.
- Turn the function switch to the BATT (battery check) position. The needle on the meter will go to the green zone if the battery is fully charged. If the needle is below the green arc or if the Low Battery Indicator comes on, the battery must be recharged before the analyzer is used.
- Set the SPAN pot to the desired value based on the gas to be used.
- Turn the function switch to the appropriate operating position. Start with the 0-2000 position and then switch to the more sensitive ranges. The UV light source should be on, confirmed by briefly looking into the probe to observe a purple glow from the lamp.

Monitoring procedures and action levels are as stated in Chapter 7.0 (Air Monitoring) of the site-specific HASP.

Calibration Procedure

- Battery check - Turn the function switch to BATT. The needle should be in the green region. If not, recharge the battery.

- Zero set - Turn the function switch to STANDBY. In this position the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control. The zero can also be set with the function switch on the X1 position using a "Hydrocarbon-free" air. In this case, "negative" readings are possible if the analyzer measures a cleaner sample when in service.
- Lamp cleaning - If the span setting resulting from calibration is 0.0 or if calibration cannot be achieved, then the lamp must be cleaned.

Headspace Screening

The HNU shall be used to screen soil samples for volatile organics in the following manner:

- Samples will be initially screened while being removed from the ground.
- Each sample will be split and a portion used to fill a jar to approximately the 3/4 level.
- The sample will be capped and allowed to stand for one hour to accumulate volatiles.
- The cap will then be opened enough to permit readings of the headspace to be taken.

WATER QUALITY FIELD INSTRUMENTATION

pH METER

Field determination of pH in water will be made by use of an analog display, self contained, battery operated, pH meter (Hach Mini pH Meter, Model 17200). The following paragraphs discuss the standardization and use of this meter.

Prior to use of this instrument, the following standardization procedure will be performed. Buffer solutions of pH 4.00 and 7.00 will be mixed by adding 50 milliliters (ml) of deionized water to each of the respective buffer powder ampules provided with the unit. The temperature of the buffer solutions will be measured and the meter will be adjusted for that temperature per manufacturer's instructions.

The protective cap will then be removed from the probe and the reference electrode solution fill hole on probe will be exposed. The pH probe must be thoroughly rinsed with deionized water prior to each use. Once the temperature of the buffer solution has been set on the instrument, the probe will be immersed in the pH 7.00 solution and the instrument will be set to read 7.0. Following a rinse of the probe, it will be immersed in the pH 4.00 solution and the span will be adjusted so that the instrument reads 4.0. The pH meter will at this time be standardized.

Measurement of pH on field samples will be made as soon as possible after sample collection. The pH value will be recorded to the nearest 0.1 standard unit.

Temperature Measurement

Temperature will be measured on all aqueous samples upon collection. Temperature will be measured with a standard field thermometer which will be rinsed between each use with deionized water (reducing the possibility of altering pH and/or conductance of the sample). The temperature will be recorded to the nearest 0.5°C.

Conductivity Meter

Field determinations of specific conductance will be made by field personnel using an analog display, battery operated conductivity meter (Hach Mini Conductivity Meter, Model 17250). The following paragraphs discuss the standardization and use of this meter.

The Conductivity Meter will be standardized using a 1413.0 micromho/centimeter ($\mu\text{mho/cm}$) KCl solution. The all constant will be calculated per the following equation:

$$C = \frac{(1413.0) [1+0.0191(t - 25)]}{K_S}$$

where:

C = cell ambient

t = observed temperature ($^{\circ}\text{C}$)

K_S = measured conductance (μmhos) of standard KCL solution

Conductivity (K) will be calculated from samples measured in the field by applying the following formula:

$$K = \frac{K_m(c)}{1+0.0191(t - 25)}$$

where:

K = conductivity (μmhos) of environmental sample corrected for temperature and cell response

K_m = measured conductivity in μmhos at temperature = t

t = observed temperature ($^{\circ}\text{C}$)

c = cell constant (cm^{-1})

The measurement of the conductance of the standard will be made at a known temperature as close to 25°C as practical. If, upon standardization of the meter, the conductance meter reading differs by more than 5 percent from the solution conductance, the meter will be adjusted. This adjustment will be made by fine tuning of the STD potentiometer on the circuit board to obtain the correct reading.

After the meter has been standardized and the probe thoroughly rinsed with deionized water, conductance measurements may be made on water samples. Upon collection of the sample, the temperature will be measured and the meter will be set for that temperature. The conductance probe is then immersed into the sample permitting the vent holes to be submerged. The instrument is then turned on and the range selector is adjusted giving the smallest range permitting the conductance measurement. Conductivity measurements will be recorded in $\mu\text{mhos/cm}$.

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HYDROLOGIC DATA COLLECTION

CONTINUOUS WATER LEVEL RECORDERS

In order to provide data on ground water fluctuations, continuous water level recorders will be strategically placed at certain monitoring wells. The recorders to be used will be the Leopold & Stevens Type F Recorder (Model 68). The installation and maintenance of these instruments is discussed in the following paragraphs.

Water level recorders will be installed at selected monitoring wells by a Remcor geologist. Installation of the recorder requires the recorder to be placed on a platform at the wellhead. The recorder is then positioned such that the float pulley is above the well bore. An appropriate length of beaded cable is chosen providing enough cable so that water level fluctuations do not permit either end of the cable to be drawn out of the well. A float is attached to one end of the cable, and a counterweight to the other end. With the beaded cable draped over the float pulley, the float and counter weight are lowered into the well.

The chart drum is removed from its supports and a chart is placed on it. Information recorded on the chart will include:

- Monitoring well identification
- Date on which chart was installed
- Time recorder was started
- clock rate (number of days the chart will last at the rate the clock is set).

Along the left margin of the chart, a scale is recorded (e.g., 1-inch on the chart equals 0.5 foot water level change).

The water level is then measured by use of a measuring device capable of producing measurements to the nearest 0.01 foot. It should be noted that in monitoring wells less than six inches (ID), it may be necessary

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to remove the float from the well to accommodate water level measurements. The water level is then recorded on the chart and the chart pen is located at the grid intersection representing the water level and the time of day.

The Quartz Multispeed Timer (QMT) is set so that the pen is driven across the chart at a predetermined rate. In most instances, where a long period of record will be obtained, the QMT setting will be such that the chart will last 32 days. The following information will be recorded on the chart at the end of the recording period (similar to the recording of information at start-up):

- Water level at the chart removal (measured with a water level meter)
- Date chart was removed
- Time chart was removed
- Field observer.

A new chart is installed on the recorder, another water level measurement is made, and the new chart is started in the same manner as previously stated.

ELECTRONIC WATER LEVEL METER

An electronic water level meter (Solinst Model 101) will be used for most water level measurements pertinent to the RI study. This meter consists of a probe which when immersed in water triggers an audible alarm and indicator light. With the power switch in the on position, the probe is lowered to the water level. When the indicators are triggered, the water level is read from the measurement tape at a predetermined point on the well. Water level measurement will be recorded to the nearest 0.01 foot. A weighted calibrated rope tape (i.e., "popper") will be used as an alternative water level measurement instrument. The weight utilized will create a popping sound upon encountering the water level in the well. The measurement is taken at the point where the popping sound is heard; accuracy will be measured to the nearest 0.01 foot.

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APPENDIX B
DOCUMENTATION FORMS

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This Appendix provides examples of the following documentation referenced in the FSAP:

- Decontamination Log
- Decontamination Label
- Field Equipment Calibration Log
- Sample Label
- Custody Seal
- Chain-of-Custody
- Sample Log Sheet
- Health and Safety Equipment Use (Personnel Entering Contaminated Areas [HS-10])
- Field Check Summary Report - Field Equipment
- Corrective Action Form
- Jobsite Safety Checklist (HS-1)
- Training Session Documentation Record (HS-3)
- Site Personnel Data Record (HS-8)
- Equipment Damage/Loss Report (HS-9)
- Site Visitors Log (HS-11)

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DECONTAMINATION LOG REFERENCE NO. _____

EQUIPMENT DECONTAMINATION LOG

1. PROJECT: _____ PROJECT NO. _____
2. DATE OF DECONTAMINATION _____
3. DECONTAMINATION LOCATION: OFFICE _____ FIELD _____
4. EQUIPMENT TYPE _____ 5. COMPANY NO. _____
6. SERIAL NO. _____ 7. PLATE NO. _____ 8. STATE _____
9. OWNER _____
10. DESCRIPTION OF DECONTAMINATION SEQUENCE

11. DECONTAMINATED BY: _____

AR300482 888483

EQUIPMENT TYPE: _____
DECON LOG REFERENCE NO. _____
DATE DECONTAMINATED __/__/____
DECONTAMINATED BY: _____

DECONTAMINATION LABEL

AR300483 16255



FIELD EQUIPMENT CALIBRATION LOG

1. PROJECT: _____ PROJECT NO. _____
2. DATE AND TIME OF CALIBRATION: _____ AM
PM
3. EQUIPMENT TYPE _____ 4. COMPANY NO. _____
5. SERIAL NO. _____ 6. PLATE NO. _____ 7. STATE _____
8. OWNER _____
9. CALIBRATION STANDARDS USED _____
10. SOURCE OF CALIBRATION STANDARDS _____
11. PERSONNEL PERFORMING CALIBRATION _____
12. RESULTS OF CALIBRATION

13. CORRECTIVE ACTIONS TAKEN _____

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CUSTODY SEAL			CUSTODY SEAL
			Date
			Signature

Figure 3. Example custody seal made of perforated paper stock.

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CHAIN OF CUSTODY RECORD

[illegible]

Figure 2. Chain-of-Custody Record

AR300487



Page ___ of ___

SAMPLE LOG SHEET
REMEDIAL INVESTIGATION
BALLY ENGINEERED STRUCTURES
BALLY ENGINEERED STRUCTURES SITE
BALLY, PENNSYLVANIA
PROJECT NO. 87313

SAMPLE NO.: _____

SAMPLE TYPE: SURFACE WATER _____

GROUND WATER

MONITORING WELL _____

INDUSTRIAL WELL _____

MUNICIPAL WELL _____

RESIDENTIAL WELL _____

SOIL _____

CONTROL TYPE (if appl.) BLANK _____ REPLICATE _____ SPIKE _____

SAMPLE DESCRIPTION AND LOCATION:

SAMPLE CONTAINER NO. TYPE (e.g., 250-ml amber glass)

_____	_____
_____	_____
_____	_____
_____	_____

SAMPLER'S INITIALS _____

DATE _____ TIME _____

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FIELD CHECK SUMMARY REPORT -FIELD EQUIPMENT

1. PROJECT: _____ PROJECT NO. _____
2. DATE LAST USED _____
3. USE LOCATION: _____
4. EQUIPMENT TYPE _____ 5. COMPANY NO. _____
6. SERIAL NO. _____ 7. PLATE NO. _____ 8. STATE _____
9. OWNER _____
10. DATE OF LAST MAINTENANCE/INSPECTION _____
11. MAINTENANCE PERFORMED

12. CONDITION OF EQUIPMENT FOLLOWING LAST MAINTENANCE/INSPECTION

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CORRECTIVE ACTION FORM

1. PROJECT: _____ PROJECT NO. _____
2. DESCRIPTION OF NONCOMPLIANCE

3. CORRECTIVE ACTION SPECIFIED

4. CORRECTIVE ACTION TAKEN

Linda K. Scholl Date
Remcor Quality Assurance Officer

AR300491

JOBSITE SAFETY CHECKLIST

Project _____

Project No. _____ Person Making Inspection _____

Jobsite Location _____

Date of Inspection _____

A. Adequate at time of inspection.
B. Needs immediate attention.

C. Item not applicable.
N/A No items in section applicable.

Check one of the following:

A B C

Check one of the following:

A B C

A. Posters & Records N/A ☐

- | | | | |
|--|--------------------------|--------------------------|--------------------------|
| 1. OSHA poster displayed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Foremen holding weekly safety meetings — recording? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Emergency medical numbers posted? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Explosives inventory current? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Copy of OSHA regulations on jobsite? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Have utility contacts been made/recorded? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Are safety talk subjects available? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Blank accident report forms available? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Using Employment Applications before hiring? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Are Safety posters being displayed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

d. Housekeeping & Sanitation N/A ☐

- | | | | |
|--|--------------------------|--------------------------|--------------------------|
| 11. General housekeeping of jobsite? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Passageways and walkways clear? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. Nails removed from lumber? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Materials of all types properly stockpiled? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Is an area provided for waste and trash and is it removed regularly? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Adequate lighting in passageways, stairways and work areas? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Toilet facilities adequate and clean? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Sanitary supply of drinking water? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. Disposable drinking cups and refuse container? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Means provided for sanitizing personal protective equipment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

C. Fire Protection N/A ☐

- | | | | |
|--|--------------------------|--------------------------|--------------------------|
| 21. Are "No Smoking" or "Flammable" signs posted at all storage and fueling locations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. Clear access provided to all fire fighting equipment/are inspections recorded? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23. Location of all fire fighting equipment prominently marked? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24. Are flammable liquids stored in approved containers? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25. Fire extinguishers adequate size? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. Large fuel tanks properly diked and separated? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

D. First Aid N/A ☐

- | | | | |
|-------------------------------------|--------------------------|--------------------------|--------------------------|
| 27. First Aid Kits well stocked? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28. Trained first-aider on jobsite? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E. Electrical N/A ☐

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| 29. Distribution boxes covered or marked? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 30. GFI's in use or positive grounding been tested? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 31. Temporary lighting protected? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

F. Tools N/A ☐

- | | | | |
|--|--------------------------|--------------------------|--------------------------|
| 32. Damaged or broken tools tagged out of service? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 33. Proper storage space provided? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34. Operative guards on all power tools? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 35. Persons using powder actuated tools certified? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36. Are guards provided on grinders? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 37. Air hose couplers secured or safety valve in line? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 38. Tools being properly used? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 39. Correct personal protection being used? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 40. Extension cords tested for assured ground? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

G. Structures N/A ☐

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| 41. Floor openings covered or guardrailed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 42. Standard guardrailing on scaffolds, bridge decks, floors of buildings, work platforms and walkways? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 43. Work areas clear of debris, snow, ice, and grease? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 44. Adequate fire protection? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 45. Stairways provided with handrails? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 46. Hollow pan-treads filled with solid material? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 47. Ladders properly constructed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 48. Side rails of ladders extend 36" above landing? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 49. Scaffolds properly anchored, braced and plumb? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 50. Protection provided over vertical rebars when working above? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 51. Safety belts in use when guardrails are absent? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 52. Employees clear of swinging crane loads? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 53. Tag lines used on suspended crane loads? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 54. Gas cylinders separated, secured upright and capped if not in use? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 55. Safety lines in use on suspended scaffolds? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 56. Heating devices properly ventilated? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 57. Gates functioning on all levels when material or personnel hoists used? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 58. Safe procedures being used to wreck forms? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



AR3004920436

A. Adequate at time of inspection.
B. Needs immediate attention.

C. Item not applicable
N/A No items in section applicable.

Check one of the following:

A B C

H. Traffic Control N/A ☐

59. Advance signing at approaches to work areas? ☐ ☐ ☐
60. Correct message on signs? ☐ ☐ ☐
61. Traffic control set-up on highways meet ODOT regulations? ☐ ☐ ☐
62. Flag persons properly dressed and equipped? ☐ ☐ ☐
63. Flag persons performing properly? ☐ ☐ ☐

I. Welding & Cutting N/A ☐

64. Using right type eye protection? ☐ ☐ ☐
65. Gages, valves, torches and lines in good condition and free of oil and grease? ☐ ☐ ☐
66. Cylinders not in use capped? ☐ ☐ ☐
67. Cylinders in use or storage secured up-right? ☐ ☐ ☐
68. Anti-flashback valves at torch? ☐ ☐ ☐
69. Stored oxygen separated from acetylene by 20 ft.? ☐ ☐ ☐
70. Fire extinguisher near welding or cutting operations? ☐ ☐ ☐
71. Adequate ventilation provided? ☐ ☐ ☐
72. Grounding for arc welding machine? ☐ ☐ ☐
73. All parts of arc welding outfits properly insulated? ☐ ☐ ☐

J. Heavy Equipment N/A ☐

74. Operators wearing hard hats? ☐ ☐ ☐
75. Hearing protection being used? ☐ ☐ ☐
76. Dust Control? ☐ ☐ ☐
77. Haul road adequate and maintained? ☐ ☐ ☐
78. Equipment speeds excessive for safety? ☐ ☐ ☐
79. Horns and back-up alarms functioning? ☐ ☐ ☐
80. Clearing cabs on machines when clearing? ☐ ☐ ☐
81. Engines shut-down when refueling or lubricating? ☐ ☐ ☐
82. Seat belts on machines with ROPS? ☐ ☐ ☐
83. Steps and hand holds adequate and safe condition? ☐ ☐ ☐
84. Adequate lighting of haul roads at night? ☐ ☐ ☐
85. Parked or unattended equipment have blade lowered to the ground? ☐ ☐ ☐
86. No hitchhikers riding on equipment? ☐ ☐ ☐
87. Full fire extinguisher near refueling tank? ☐ ☐ ☐
88. Dump man prominently located? ☐ ☐ ☐
89. Overhead guard on fork lift truck? ☐ ☐ ☐
90. Vehicles with restricted rear visibility equipped with operating back-up alarms? ☐ ☐ ☐

K. Cranes N/A ☐

91. Power line distance from machines? ☐ ☐ ☐
92. Annual inspection? ☐ ☐ ☐
93. Cables in safe condition? ☐ ☐ ☐
94. Rear swing protection and pinch point guarding? ☐ ☐ ☐
95. Exposed gears, shafts and belts guarded? ☐ ☐ ☐
96. Fire extinguisher, boom angle indicator, load capacity chart and hand signal poster in crane? ☐ ☐ ☐
97. Signs and/or flags on cranes in transit? ☐ ☐ ☐
98. Operator making daily inspections and tests? ☐ ☐ ☐

L. Trenching & Excavations N/A ☐

99. Trench side shored, lagged back or boxed? ☐ ☐ ☐
100. Utilities contacted and located before digging? ☐ ☐ ☐
101. Ladder in the trench? ☐ ☐ ☐
102. Stop logs placed where necessary along top of the trench? ☐ ☐ ☐

Check one of the following:

A B C

103. Excavated material stockpiled far enough from the edge of the trench? ☐ ☐ ☐
104. Laser warning signs in place? ☐ ☐ ☐
105. Adequate ventilation in pipe? ☐ ☐ ☐
106. Traffic control adequate? ☐ ☐ ☐
107. Sides of excavation for building shored or protected? ☐ ☐ ☐
108. Oxygen level tested in tunnel, shafts or confined space? ☐ ☐ ☐
109. Public protected from exposure to open excavation? ☐ ☐ ☐

M. Miscellaneous N/A ☐

110. Sufficient quantities of approved personal protective equipment on the jobsite? ☐ ☐ ☐
111. Procedures established to handle toxic and carcinogenic materials? ☐ ☐ ☐
112. Sewers, vaults, tanks and bins tested for adequate oxygen levels before employees are permitted to enter? ☐ ☐ ☐
113. Everyone wearing hard hat? ☐ ☐ ☐
114. Fall protection being used on steel erection? ☐ ☐ ☐
115. Walls properly braced (concrete and block construction)? ☐ ☐ ☐
116. Toxic fumes, vapors and dusts present, is ventilation adequate? ☐ ☐ ☐
117. Guards in place and used on wood working machines? ☐ ☐ ☐
118. Explosives being used, transported and stored in compliance with regulations? ☐ ☐ ☐
119. Blaster following all safety precautions? ☐ ☐ ☐
120. Tunneling operations/lighting and ventilation adequate? ☐ ☐ ☐
121. Belts, pulleys, shafts, gears and chains guarded on all machinery and equipment? ☐ ☐ ☐
122. Masonry saws grounded and personal protective equipment being used? ☐ ☐ ☐
123. Exit signs over doors in offices and storage buildings? ☐ ☐ ☐

*This checklist does not include all hazards on every job, but is intended to remind you of most common hazards.

Unsafe acts and/or practices observed:

I the undersigned superintendent have reviewed the indicated hazards and will take the necessary action to immediately correct them.

Signature of Project Supervisor

AR300493



SITE PERSONNEL DATA RECORD

EMPLOYEE NAME: _____

START DATE: _____ POSITION: _____

ADDRESS: _____

HOME PHONE NO. _____

LOCAL PHONE NO. _____

TO BE NOTIFIED IN CASE OF INJURY/ILLNESS:

NAME: _____ RELATIONSHIP: _____

ADDRESS: _____ PHONE: WORK _____

_____ HOME _____

CLIENT: _____ LOCATION: _____

AR300495-200



EQUIPMENT DAMAGE/LOSS REPORT

1. PROJECT: _____ PROJECT NO. _____ AM
2. DATE AND TIME OF LOSS _____ PM
3. LOSS LOCATION: _____
4. EQUIPMENT DAMAGED _____ 5. COMPANY NO. _____
6. SERIAL NO. _____ 7. PLATE NO. _____ 8. STATE _____
9. OWNER: _____
10. OPERATOR AND ADDRESS: _____
11. DESCRIBE LOSS: _____
12. LIST OUR DAMAGE: _____
13. ESTIMATED REPAIR COST: _____ 14. WHAT POLICE NOTIFIED _____
15. PROPERTY DAMAGE _____
16. OTHER OWNER/OPERATOR: _____
17. OTHER INSURANCE COMPANY: _____
18. LIST OTHER DAMAGE _____
19. WITNESS: _____
20. TYPE OF LOSS: ☐ Coll ☐ Theft ☐ Fire ☐ Water ☐ Vand ☐ Other
- REPORTED BY _____ SUPERINTENDENT _____

AR300496



Project Name:

Project Number:

[illegible]

AR300497